486962

**ADMINISTRATIVE RECORD**

# EPA Region 8

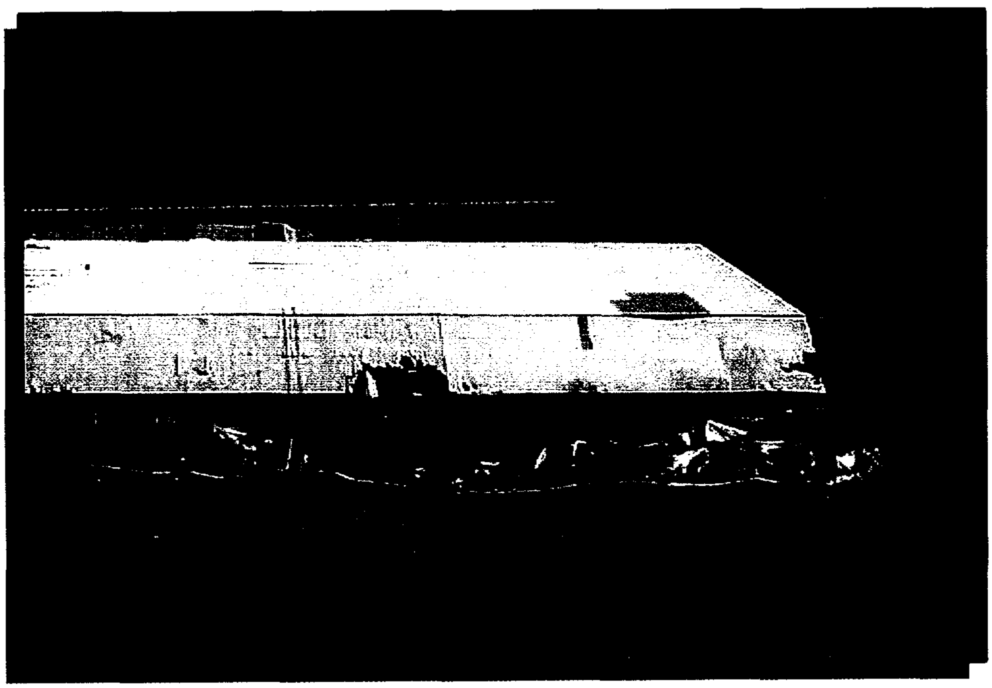
U.S. Environmental Protection Agency
Region 8
999 18th Street
Suite 500, 8EPR-ER
Denver, Colorado 80202-2466

# Screening Facility

## **FINAL** Removal Action Work Plan

*Libby, Montana Asbestos Emergency Response Project*

June 18, 2001



Prepared by:

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# Section 1
# Introduction

## 1.1 Project Understanding

The Environmental Engineering Division (DTS-33) of the John A. Volpe National Transportation Systems Center (Volpe Center) is providing environmental engineering and contaminant removal support to Region 8 of the U.S. Environmental Protection Agency (EPA) for the Libby Asbestos Project in Libby, Montana. In May 2000, the Volpe Center, their contractor CDM Federal Programs Corporation (CDM), and its subcontractor, Pacific Environmental Services, Inc. (PES), along with the Volpe Center's removal/demolition contractor, MARCOR Remediation, Inc. (MARCOR), submitted a Removal Action Work Plan (RAWP) dated May 17, 2000 to EPA. EPA approved the RAWP for the 2000 construction season and has designated the work at the former Screening Plant site as a fund-lead. The purpose of this 2001 Work Plan is to coordinate and plan the completion of removal activities began in 2000 at the Screening Plant site, conduct supplemental soil sampling, and complete remaining removal and restoration activities during the 2001 construction season.

## 1.2 Background Information for the Screening Plant

### 1.2.1 Historic Site Usage

The Screening Plant was utilized for many years to sort mined vermiculite by grade. The vermiculite was transported to the site by truck, sorted and bulk stored in two sheds at the facility. The vermiculite was then loaded onto a conveyor(s) and transported across the Kootenai River. Once the vermiculite was transported across the river to the railroad track, it was loaded onto rail cars for transportation and distribution and trucked to the Export Plant for processing and shipping.

The former Screening Plant was most recently used primarily as a fully operational retail nursery business for growing, storing, and selling of plants, flowers, trees, and related items. The owners of the property lived on the site in a one-story structure that served both as an office and as a residence. The largest structure on the property was the Long Shed. The three-sided Long Shed was constructed of structural steel members, corrugated metal sides and roof, and a reinforced concrete floor. Approximately one-third of the Long Shed was used to store nursery supplies, tools and equipment used in the nursery business. The remaining two-thirds of the Long Shed's space was used as leased storage. Recreational vehicles (RVs), trailers, boats, automobiles, and numerous other articles belonging to others were stored in the Long Shed.

Five greenhouses constructed of steel tube frames with plastic coverings were used for growing plants, flowers, and shrubs. A number of smaller buildings and support structures were used in the nursery operation. Two reinforced concrete tunnels were used to grow mushrooms shipped to the Far East for use as medical treatments.

A number of steel tanks, hoppers, silos, and other remnants of the Screening Plant's former use as an asbestos sorting and loading facility were stored on the site.

The former Screening Plant site is currently owned by Melvin G. and Lerah Lorene Parker and has been designated as Operable Unit 02 by EPA. Photographs of Operable Unit 02 taken during the site walkover were provided in Appendix A of the 2000 RAWP.

### 1.2.2 Contents of the 2000 RAWP

The 2000 RAWP dated May 17, 2000 provided detailed background information on Operable Unit 02, such as site acreage, abutters, general conditions of site structures, soil conditions, existing infrastructure and utilities, and existing vegetation. The 2000 RAWP also discussed the availability of water, cultural resources, transportation and disposal options, and special logistical considerations. The 2000 RAWP also described the time critical removal and related activities planned for the 2000 construction season. Removal planning and execution activities addressed in the 2000 RAWP included:

- Inventory of items stored on site
- Assessment of disposal or decontamination of stored items
- Record keeping and RCMS protocols
- Transport to and disposal at Hole No. 23 at the abandoned mine
- Traffic, dust suppression, and erosion controls
- Demolition/dismantling procedures
- Equipment and personnel decontamination procedures
- Procurement of topographic and boundary surveys
- Procurement of archaeological and cultural surveys
- Removal of asbestos-containing soils
- Health and Safety Plan requirements
- Sampling and QA Project Plan
- Construction QA Plan
- Air monitoring requirements
- Anticipated drawings and technical specifications

Removal activity at the site began with a site walkover on April 11, 2000 and concluded on December 13, 2000 when removal activities at Operable Unit 02 were shut down for the winter. Information included in the 2000 RAWP was obtained during the site walkover and subsequently from copies of excerpts from an assessor's report prepared for the present owners of the Screening Plant site. The 2000 RAWP should be referenced for detailed information addressing the observations made by the Government and its contractors during the site walkover. The 2000 RAWP also includes a detailed description of the structures on the site prior to their demolition in 2000. Figure 1-1 provides the general locus plan of the Screening Plant and the vermiculite mine site. Figure 1-2 provides the location of the Screening Plant and vermiculite mine site on the USGS quadrangle map.

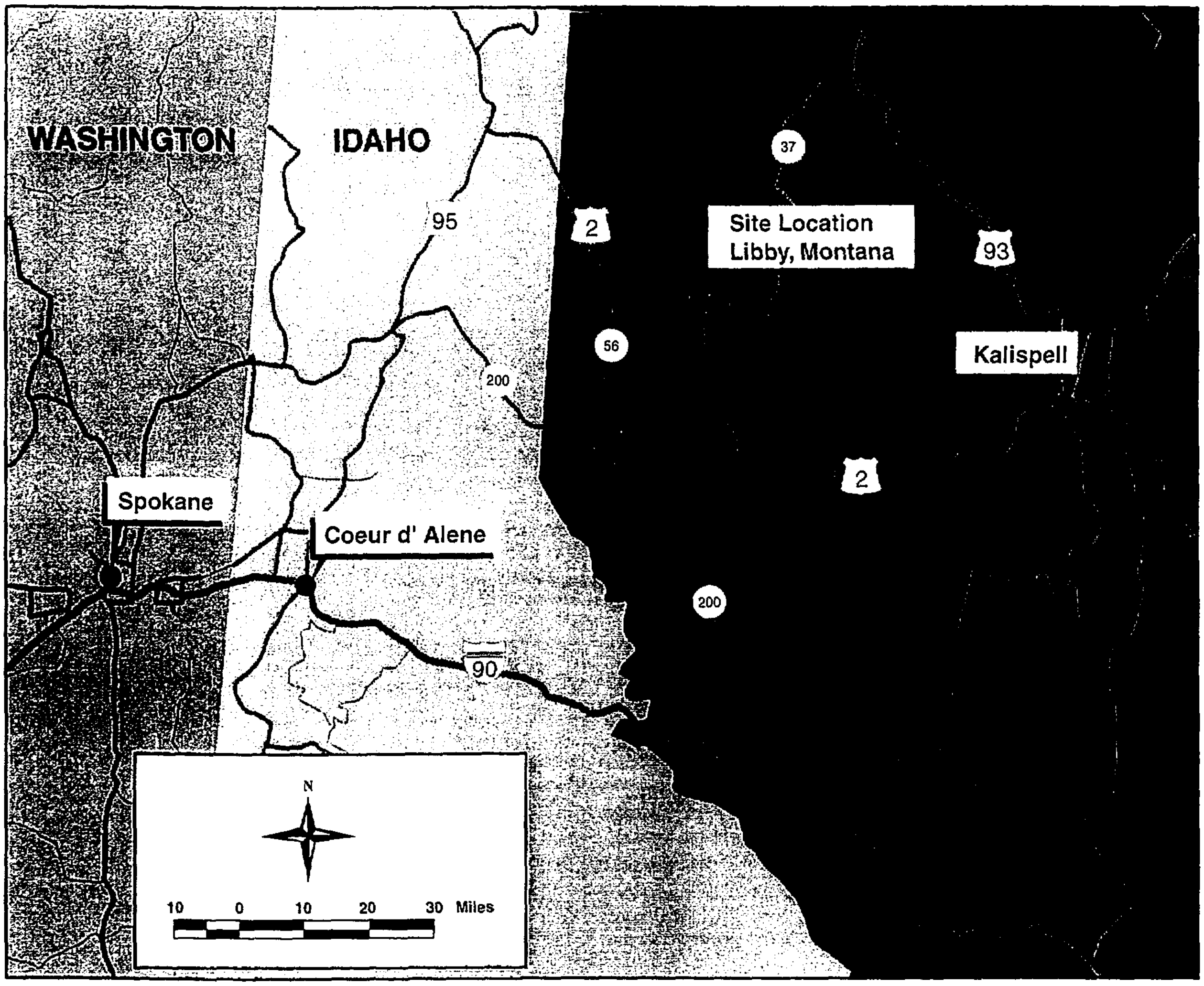
### 1.2.3 Modifications to the 2000 RAWP

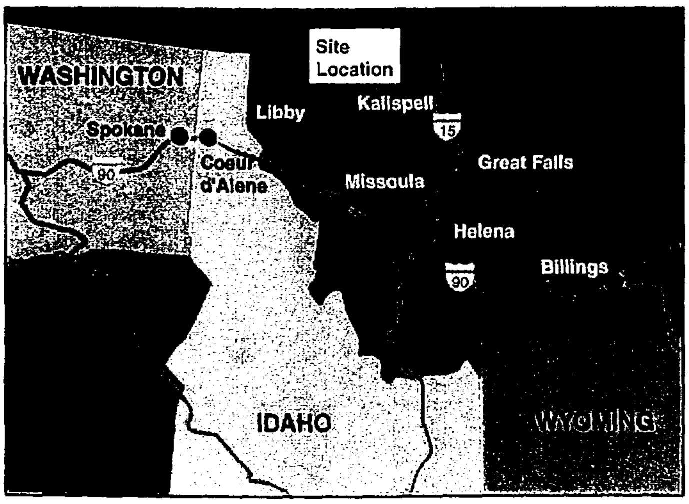
As the planned removal actions began at Operable Unit 02, it became necessary to modify work activities to meet the evolving needs of the project. Modifications to the 2000 RAWP were necessitated by revised soil sampling and excavation requirements and to accommodate restrictive occurrences, primarily denial of EPA access to the abandoned mine site for disposal of asbestos contaminated soils and demolition debris. For a detailed description of modifications to the 2000 RAWP, it is recommended to refer to "Amendment No. 1 to Removal Action Work Plan dated May 17, 2000." However, the major modifications to the 2000 RAWP included:

- Stockpiling excavated soils on site
- Stockpiling demolition debris on site
- Placing riprap at Rainy Creek discharge
- Increasing soil excavation depths
- Site soil sampling
- Erosion controls during winter shutdown
- Installation of barrier fabric

# Color Chart(s)

The following chart(s) contains color that does not appear on the scanned image(s).




DOT Volpe Center

Figure 1-1
Site Locus Plan
Libby, Montana

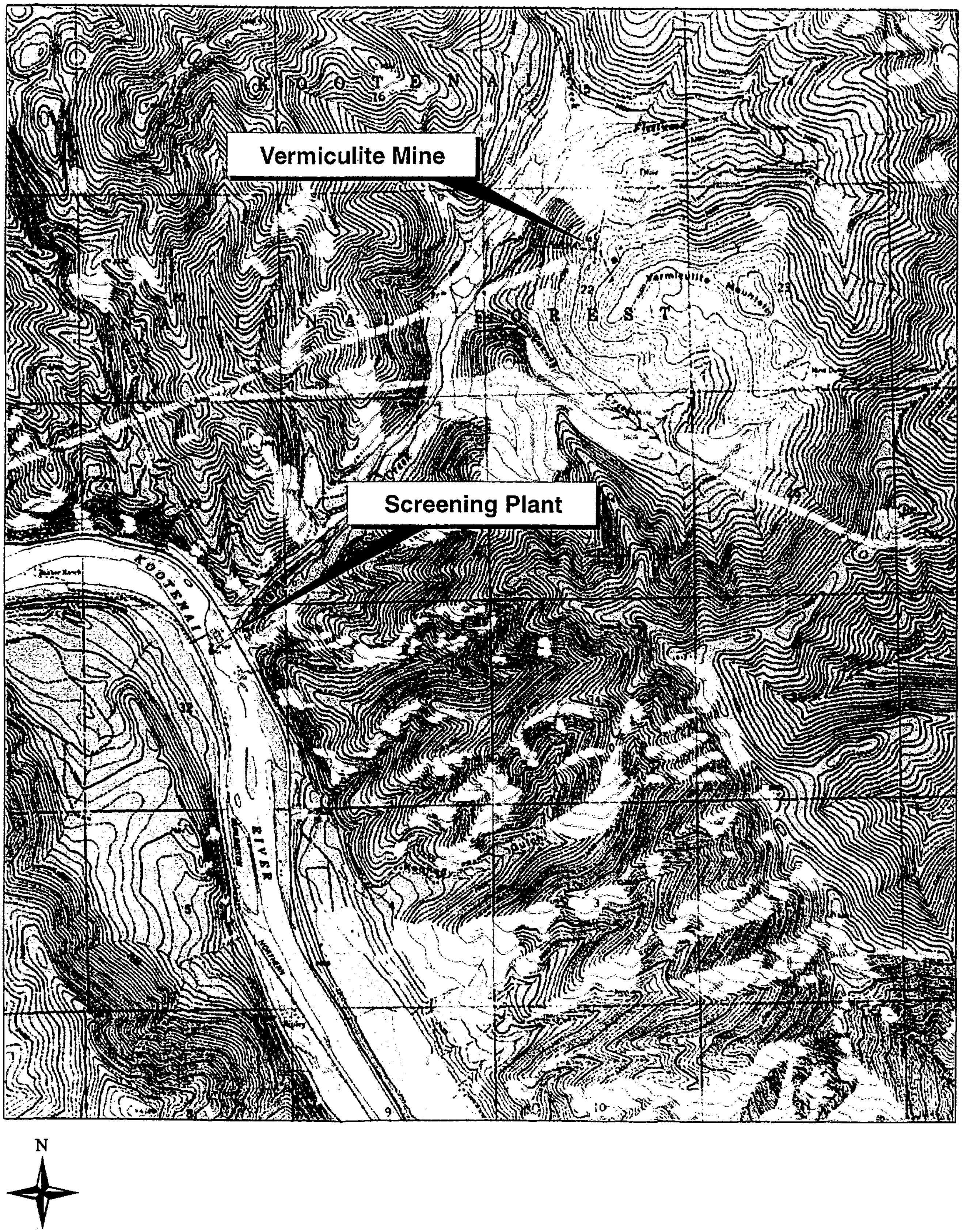



Figure 1-2
Site Location

# Section 2
# Summary of Work Completed in 2000

## 2.1 Planning Activities

### 2.1.1 2000 Removal Action Work Plan

A Remedial Action Work Plan (RAWP) dated May 17, 2000 was prepared by the Volpe Center for proposed removal activities at the Screening Plant Site. The 2000 RAWP included the requirements for preparing site specific planning documents as well as procedures and performance requirements for the planned removal actions at Operable Unit 02. Following is a brief description of the planning documents prepared in 2000.

### 2.1.2 Health and Safety Plan

CDM developed and implemented a site specific Health and Safety Plan (HASP) addressing sampling and removal action oversight at the site. The removal contractor developed and implemented a site specific Health and Safety Plan for all removal actions and demolition activities at this site. Health and Safety Plans were developed and implemented in accordance with the U.S. Occupational Safety and Health Administration (OSHA) Standard 29 CFR Part 1910 and Part 1926, Occupational Safety and Health Standard for the Construction Industry, and all applicable OSHA Health and Safety Requirements.

The Health and Safety Plan was reviewed and approved by a Certified Industrial Hygienist (CIH) prior to initiating sampling, oversight and removal actions. The Health and Safety Plan addressed the following:

- Overview of the potential hazards at the work site
- Identification of safe work practices
- Training and medical monitoring requirements
- Personal protective equipment requirements
- Communication and emergency notification procedures
- Project documentation

The removal contractor reviewed the plan with all removal action personnel prior to their working on the site. Daily Health and Safety briefings were held at the job site. All removal actions, oversight, and sampling activities at this site were conducted in accordance with the approved site specific Health and Safety Plans.

### 2.1.3 Engineering Drawings and Technical Specifications

The following technical specification sections were developed and implemented during the 2000 removal actions at the site:

| Section | Description |
|---|---|
| *Division 1* | *General Requirements* |
| 01010 | Scope of Work |
| 01035 | Control of Work |
| 01100 | Special Project Procedures |
| 01110 | Environmental Protection Procedures |
| 01300 | Submittals |
| 01311 | Construction Scheduling |
| 01580 | Project Identification and Signs |
| 01590 | Temporary Facilities |
| 01700 | Contract Closeout |
| *Division 2* | *Sitework* |
| 02040 | Decontamination |
| 02050 | Decontamination, Demolition and Removals |
| 02200 | Earthwork |
| 02230 | Granular Fill Materials |
| 02250 | Watering |
| 02270 | Sedimentation and Erosion Control |
| 02575 | Paving and Surfacing |
| 02713 | Stormwater Management |
| 02776 | High Density Polyethylene Membrane Liner |
| 02830 | Chain Link Fences |
| 02910 | Seeding |
| 02920 | Hydraulic Seeding |
| *Division 13* | *Special Construction* |
| 13574 | Collection, Storage, Sampling, Transportation and Disposal of Liquid Waste |
| 13615 | Transportation and Disposal of Non-Hazardous and/or Hazardous Material |
| 13617 | Disposal of ACM Rubble, Facilities, Building Contents, and Soil |
| 13680 | Health and Safety |
| 13695 | Draining, Removal and Disposal of Light Fixture Ballasts, Transformers, Mercury Switches and Oil or Other Liquid-Filled Equipment |
| 13705 | Asbestos Abatement |
| 13720 | Dust Suppression |
| 13780 | Air Monitoring (Performed by the Government's Air Monitoring Consultants) |

## 2.2 Pre-Removal Activities

### 2.2.1 Topographic and Boundary Surveys

Detailed property line and topographic surveys were prepared for this site by a registered land surveyor licensed in the State of Montana prior to initiation of on-site construction activities. Known physical features and structures on the site were located on the topographic survey. A reduced copy of the topographic survey of the property prior to initiation of demolition and soil excavation activities is provided as Figure 2-1. Benchmarks were established on the site.

### 2.2.2 Archaeological and Cultural Survey

Archaeological Site 24LN1045 was first determined to be eligible for the National Register of Historic Places by the Corps of Engineers (COE) on December 29, 1978. Tests on this site in 1978 and in 1993 through 1994 determined that it contained significant archaeological information. The extent of removal actions at the Screening Plant have been coordinated with the findings of a professional archaeologist and EPA with respect to Archaeological Site 24LN1045. Figure 2-2 shows 1994 information from the Montana Historical Society files relative to the location of Archaeological Site 24LN1045 and an exposed artifact area. Archaeological surveys and excavations have been completed at the site. An archaeological report summarizing this component of the excavation process is currently being prepared.

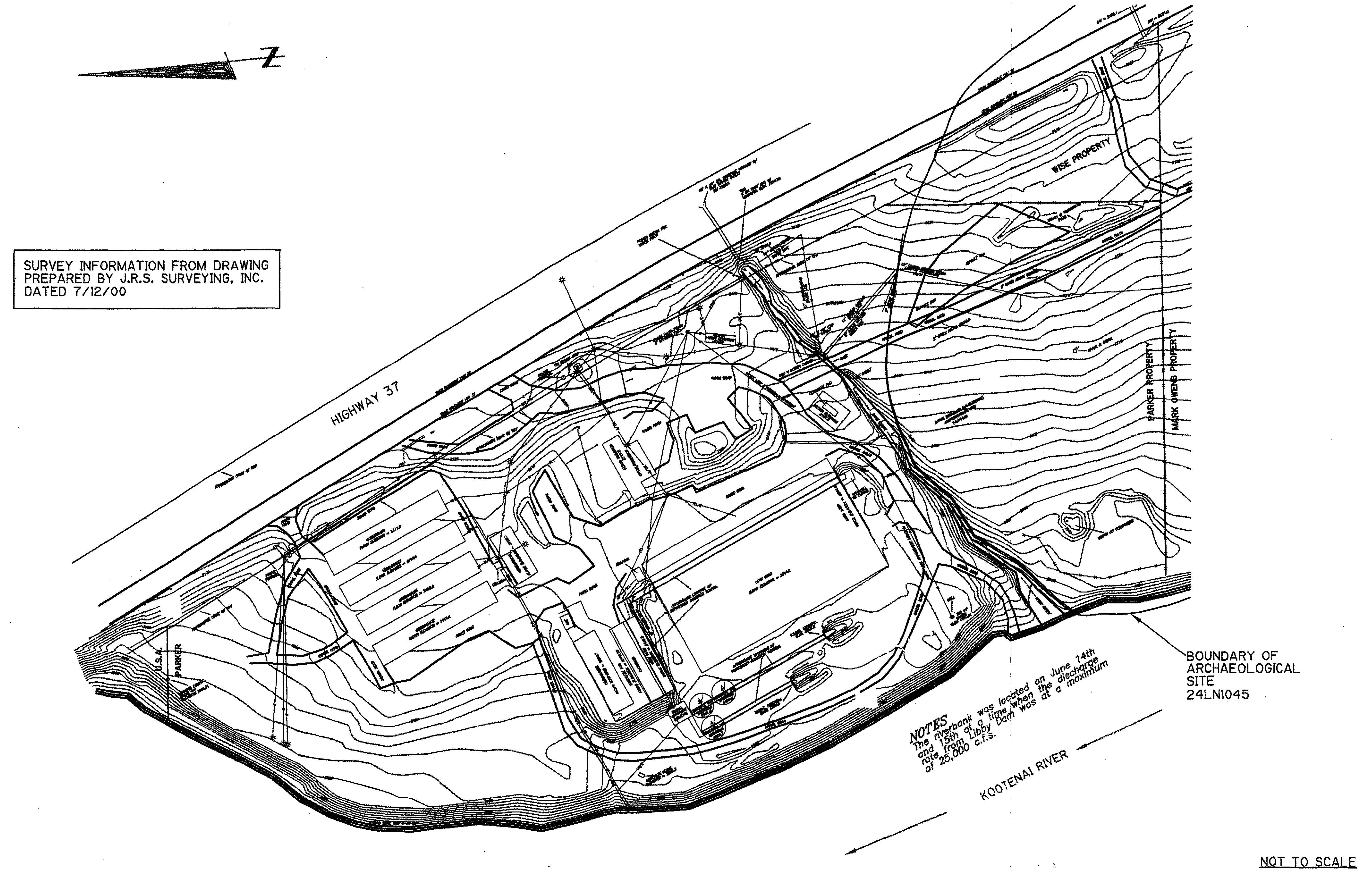
### 2.2.3 Inventory and Disposition of Property Contents

An inventory of items stored in the Long Shed and other site structures was prepared by Government employees and Government contractors. Ownership of each article was determined. In most cases, articles stored in the Long Shed were tested for contamination with asbestos fibers. Items determined to be suitable for reuse were cleaned and inspected to confirm that they had been satisfactorily decontaminated before being returned to their respective owners or stockpiled for disposal.

Following inspections and testing of the owners' residence, the Government determined that the structure and its contents needed to be demolished and contents disposed. The property owners were relocated to temporary rental housing.

### 2.2.4 Soil Sampling

A soil sampling program was implemented by the Government to determine the presence of asbestos contaminated soil requiring removal at the site. Soil sampling results are presented in Figure 2-3.

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CONTRACTOR SUPPORT PROVIDED BY:
CDM Federal Programs Corporation
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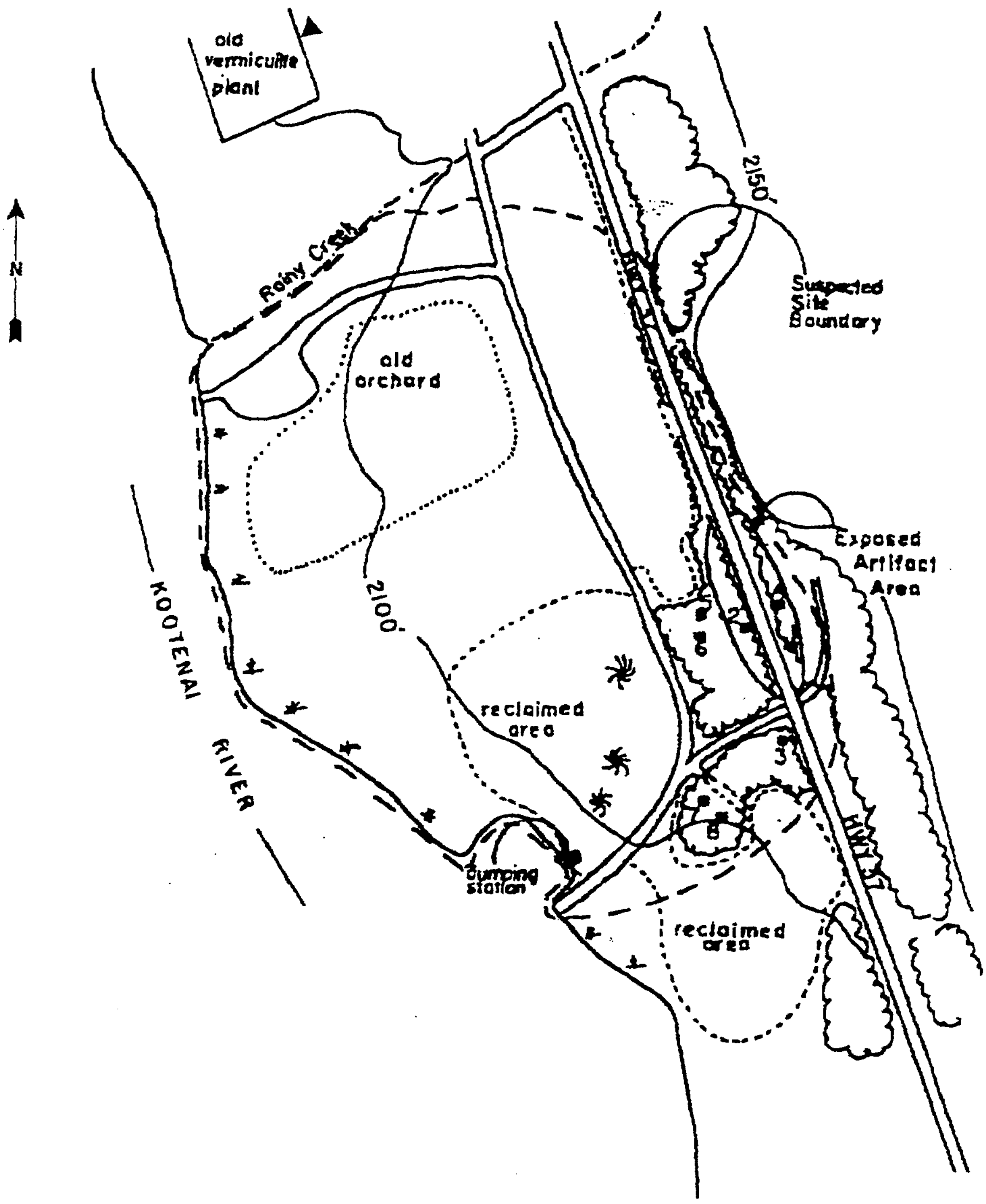
**FORMER SCREENING PLANT SITE**
(OPERABLE UNIT 02)
LIBBY, MONTANA

FIGURE 2-1

O:\CAM_IHW\LIBBY\FIG2-1.DWG

## Screening Plant




NOT TO SCALE

Figure 2-2
Source: Montana Historical Society
1/6/94 Sketch Map for Archaeological Site 24LN1045

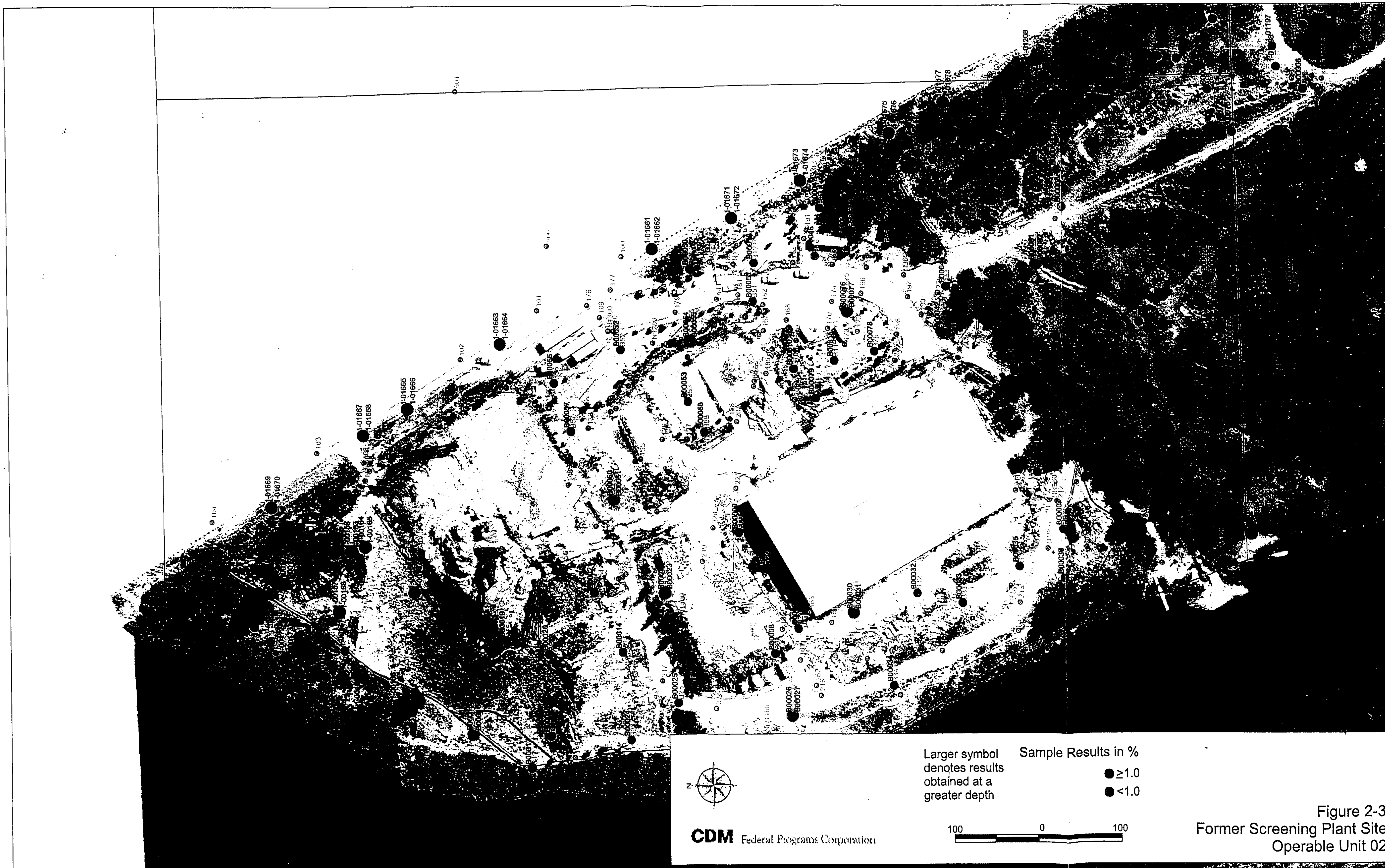



Figure 2-3
Former Screening Plant Site
Operable Unit 02

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### 2.2.5 Test Pit Program

Under the direction of EPA's temporary On Scene Coordinator (OSC), a test pit program was implemented at the site. The sampling parameters consisted of excavating a test pit and collecting a soil sample at a depth of 4 feet. The soil sample from the 4-foot depth was analyzed by the PLM Method, and if found to contain 1 percent or greater asbestos, a sample collected from a depth of 5 feet was then taken and analyzed.

This procedure continued until a cut off at a depth of 8 to 10 feet was reached. If the soil sample collected from the test pit at a 4 foot depth was found to have less than 1 percent asbestos or a non-detectable level, a soil sample was collected from a 3 foot depth and analyzed. This procedure continued until reaching ground surface. Results of the test pit program were displayed on a scale drawing of the site overlaid with a 100 foot x 100 foot grid system. Based on this test pit program, EPA elected to excavate to a depth of 4 feet in the north portion of the site and 18 inches on the south portion of the site.

## 2.3 Removal Activities

### 2.3.1 Mobilization and Temporary Facilities

The removal contractor mobilized to the site and set up an office trailer for its use and a separate trailer with conference room for use by the EPA, Volpe Center, and CDM. Perimeter fencing around the exclusion zone was installed.

### 2.3.2 Air Monitoring

Throughout the soil sampling and removal activities conducted in 2000, air monitoring, as described in Section 3.1.3 of this work plan, was conducted at Operable Unit 02 throughout the work period.

### 2.3.3 Dust Suppression Procedures

Throughout demolition/dismantling of structures, soil excavation, stockpiling, and backfilling, dust suppression was achieved by misting and watering mechanical equipment, trucks etc.

### 2.3.4 Removal and Disposal of Building Contents

Volpe Center staff prepared an inventory of items stored in the Long Shed and Parker residence. A few salvageable items were decontaminated and returned to their owners. Remaining items were stockpiled on site for future disposal.

### 2.3.5 Demolition/Dismantling of Structures

The following structures were demolished during the 2000 construction season:

Shade House and Fruit Stand
Nursery Office and Owners' Residence
Five (5) Greenhouses
West Shed
Break Room
Lab and Extraction Room
Underground Tunnels
Manufactured Home/Office

Demolition debris was stockpiled on the site as the owner of the abandoned mine site denied EPA and Government contractors access for disposal of demolition debris and asbestos contaminated soils.

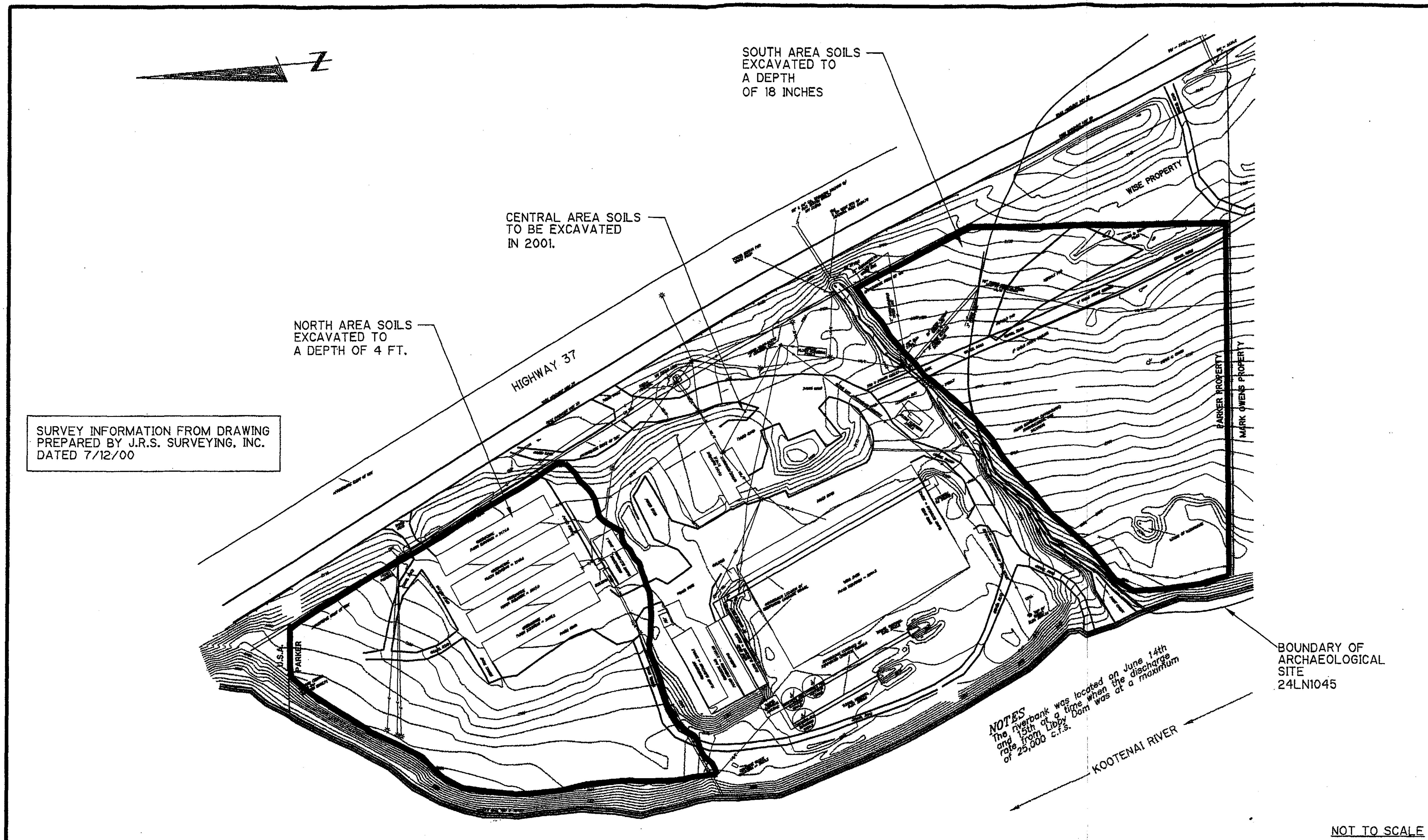
### 2.3.6 Excavation of Contaminated Soil

It was originally planned to remove suspect soil in 6-inch increments with confirmatory sampling at each increment, to a maximum depth of 18 inches. Areas of the site to be excavated were determined by sampling for the presence of asbestos. However, as the test pit program evolved and confirmatory sampling was performed at Operable Unit 02, EPA elected to excavate the top 4 feet of soil from the portion of the site north of Rainy Creek, and 18 inches from the portion of the site south of Rainy Creek. The test pit program followed by a uniform depth of excavation proved to be a more productive and efficient approach to removing asbestos contaminated soils from the predetermined depths. At this time, the maximum depth of soil to be removed from confirmed contaminated areas of the site is 4 feet. Figure 2-4 shows the approximate limits of soils excavated in 2000 and stockpiled in and around the Long Shed.

### 2.3.7 Stockpiling of Excavated Soils

EPA's intent was to dispose all excavated soil meeting or exceeding removal criteria and demolition debris from Operable Unit 02 at the abandoned vermiculite mine. However, the mine's owners denied access to the abandoned mine site for this purpose. Demolition debris and excavated asbestos-containing soil were kept segregated and stockpiled at the site for future disposal. Excavated soils were stockpiled in and around the Long Shed. Stockpiled soils were covered with polyethylene sheeting and rope tiedowns for the winter. Stockpiled demolition debris was stored between Highway 37 and the Long Shed.

Since the winter shutdown of work at the site, a court ruling has granted EPA access to the abandoned mine site for disposal of asbestos-containing soils and demolition debris. In transporting stockpiled soils and soils excavated during the 2001 construction season to the mine site, EPA will, to the extent practical, comply with all applicable or relevant and applicable requirements (ARARs).

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**FORMER SCREENING PLANT SITE**
(OPERABLE UNIT 02)
LIBBY, MONTANA

FIGURE 2-4

O:\CAM_IHW\LIBBY\FIG2-4

### 2.3.8 Backfilling and Compaction

Following confirmatory soil sampling and placement of the permeable geotextile fabric layer, the north portion of Operable Unit 02 was backfilled with 3.5 feet of compacted common fill approved by the Government.

### 2.3.9 Riprap

An area on the southern bank of Rainy Creek at the Kootenai River was found to contain high concentrations of vermiculite. Following the excavation of this material, the disturbed area was backfilled with common fill, graded, and riprap placed to prevent erosion of the creek and riverbanks during anticipated higher river elevations during the spring thaw.

### 2.3.10 Erosion Control

Erosion controls consisting of stacked hay bales and silt screen fabric were installed by the removal contractor prior to starting excavation at Operable Unit 02.

In order to mitigate erosion and runoff from the site during the winter shutdown period and spring thaws, CDM designed interim erosion controls for excavated areas of the site. These interim measures included drainage ditches, hay bales, swales, and sedimentation ponds. Two drawings with specifications were prepared to provide slope elevations, material requirements, and technical requirements for this work. These drawings are included in Amendment No. 1 to Removal Action Work Plan dated May 17, 2000.

# Section 3
# Work Planned for 2001

## 3.1 Planning Activities

### 3.1.1 Introduction

The Construction Quality Assurance Plan and Engineering Drawings and Technical Specifications developed in 2000 for the removal activities started in 2000 at Operable Unit 02 will remain in effect for 2001.

### 3.1.2 Prepare Health and Safety Plan Requirements

CDM is preparing a comprehensive Health and Safety Plan (HASP) for the site. An individual contractor may develop its own HASP in accordance with that company's corporate policy; however, each contractor will be responsible for conducting its work and the work of its subcontractors in compliance with the comprehensive HASP for the site. The comprehensive Health and Safety Plan will be developed and implemented in accordance with the U.S. Occupational Safety and Health Administration (OSHA) Standard 29 CFR Part 1910 and Part 1926, Occupational Safety and Health Standard for the Construction Industry, and all applicable OSHA Health and Safety Requirements.

The Health and Safety Plan will be reviewed and approved by a Certified Industrial Hygienist (CIH) prior to initiating removal actions. All modifications to the Health and Safety Plan that are required during the removal action at the site will also be reviewed and approved by the project CIH prior to being implemented. The Health and Safety Plan will be included in the removal action specifications and will address the following:

- Overview of the potential hazards at the work site
- Identification of safe work practices
- Training and medical monitoring requirements
- Personal protective equipment requirements
- Communication and emergency notification procedures
- Project documentation

Once the site specific Health and Safety Plan has been approved by the CIH, the removal contractor will review the plan with all removal action personnel. All removal actions at this site will be conducted in strict accordance with the approved site specific Health and Safety Plan.

### 3.1.3 Prepare Air Monitoring Requirements

Air monitoring will be conducted to determine airborne dust and asbestos fiber levels during the removal actions. Air monitoring will be performed by the air monitoring consulting firm and by the removal contractor. Air monitoring will be performed prior to the initiation of removal actions to determine background levels of dust and fibers in the air. Air monitoring will be performed during removal actions and demolition activities to ensure that dust and fibers are not being released from the work areas during removal actions, determine the appropriate level of respiratory protection for removal action workers, and to document dust and fiber levels following the removal actions.

Air monitoring will be performed using continuous aerosol monitors and by collecting samples for analysis by transmission electron microscopy (TEM). The MIE DataRAM™ Portable Real Time Aerosol Monitor will be used to conduct continuous air monitoring on the perimeter of the project site to determine the total mass of airborne dust and fibers (expressed as micrograms per cubic meter ($ug/m^3$) of air). Air samples that will be analyzed by TEM will be collected and analyzed in accordance with Appendix A of the EPA's AHERA regulation (40 CFR Part 763) in accordance with ISO 10312 counting rules. Sample results analyzed by TEM will be expressed as asbestos structures per square millimeter ($structures/mm^2$).

#### Background Air Samples

The air monitoring consulting firm will collect background air samples at the project site to determine background airborne asbestos fiber levels prior to the start of the emergency removal action. The consulting firm will collect air samples for TEM analysis at identical locations on the project site on two different days to determine background airborne asbestos fiber levels. The background air samples will be compared to the final clearance air samples to ensure that airborne asbestos fiber levels at the completion of the removal action are equal to or lower than the asbestos fiber levels present prior to initiating the removal action.

#### Ambient Daily Air Monitoring

The air monitoring firm will conduct air monitoring during the removal action at the project site to ensure that airborne dust and fibers are not being released during the removal action. The air monitoring firm will collect air samples along the perimeter of the project site, in clean rooms, and at the exhaust of negative air machines. Air sampling locations shall be as determined by the air monitoring firm and approved by the Government.

The air monitoring firm will place up to eight MIE DataRAM™ Portable Real Time Aerosol Monitors along fixed locations along the perimeter of the project site. The DataRAMs will provide continuous monitoring of the total mass of airborne particulates on the site perimeter. The air monitoring firm will also collect air samples for TEM analysis at these same fixed locations on the perimeter of the project to.

determine the concentration of airborne asbestos fibers. The air monitoring firm will analyze the data collected from the DataRAM and the TEM analyses to establish trends between airborne particulate levels and asbestos levels.

The air monitoring firm will also collect air samples in the clean rooms of decontamination chambers, at the exhaust of negative air machines, and other appropriate areas on the project site. The purpose of these samples is to document that clean rooms are actually clean and that the negative air machines are not exhausting asbestos fibers.

### OSHA Compliance Air Samples

The removal contractor will collect daily personal air samples on its workers to document compliance with the Occupational Safety and Health Administration's (OSHA) Asbestos Standard for the Construction Industry (29 CFR Part 1926.1101).

The removal contractor will collect time-weighted average (TWA) and excursion samples from ten percent (or a minimum of two) of the workers each day removal action work is performed. The TWA samples will be started at the beginning of each work day and will be turned off at the conclusion of each work day. TWAs will be adjusted using the Brief and Scala Method for workdays that last longer than eight hours. Thirty-minute excursion samples will be collected from workers during work activities that are expected to generate the highest fiber levels.

The results of the TWA and excursion samples will be compared to the Asbestos in Construction Standard to determine if the level of respiratory protection worn by removal action workers is adequate.

### Ambient Final Clearance Air Samples

After each building or structure on the project site has been decontaminated, the air monitoring firm will perform a detailed visual inspection of the building or structure to ensure that vermiculite and dust have been adequately removed. Since each building and structure at the project site will be demolished, final clearance air samples are not required prior to demolishing the building or structure. Therefore, once a building passes the final visual inspection, the building can be dismantled.

At the conclusion of the removal action for the entire project site, the air monitoring firm will collect final clearance samples. The air samples will be collected and analyzed by TEM. The samples will be collected at the same locations as the background samples collected prior to the initiation of the removal action. These samples will be compared to the background air samples to ensure that airborne asbestos fiber levels at the completion of the removal action are equal to or lower than the background fiber levels.

### 3.1.4 Prepare Construction Quality Control and Quality Assurance Plan

The text portion of the Sampling and Quality Assurance Project Plan developed by EPA is provided in Appendix A. Applicable requirements of this plan will be implemented during the removal/demolition activities described in this RAWP.

### 3.1.5 Decontamination and Dust Suppression Requirements

#### 3.1.5.1 Decontamination Requirements

The contents of the buildings and structures and the buildings and structures themselves will be decontaminated by the removal contractor during the removal actions at this site. In addition, construction equipment such as backhoes and trucks will be decontaminated prior to leaving the project work site. Removal action personnel will be required to decontaminate themselves at the end of each work shift before leaving the project work site. Prior to the start of the removal actions, site specific decontamination and cleaning procedures will be developed by the removal contractor and reviewed by the Government. The procedures shall address decontaminating personnel, construction equipment, contents of the buildings, and the buildings themselves. The following paragraphs provide an overview of the decontamination and cleaning activities.

#### 3.1.5.2 Personnel Decontamination

The removal contractor will furnish and install separate personnel decontamination facilities at the site for male and female removal action workers to shower at the completion of each work shift. The decontamination facility will consist of a minimum of a clean room, shower room, and dirty room separated by air locks. The facility will have hot and cold running water, and will have a negative air system that prevents fibers from being released into the clean room. All shower water will be filtered to remove asbestos fibers before being released to the environment. Workers will enter the dirty room, remove their protective clothing, step into the shower room and shower, then enter the clean room before taking work breaks or leaving the work site for the day. The personnel decontamination facility will be available for use by the engineer, federal, and state agency personnel throughout the duration of the project.

#### 3.1.5.3 Decontamination of Construction Equipment

A variety of construction equipment and vehicles, such as backhoes, loaders, dump trucks and bobcats, will require decontamination before leaving the job site to prevent asbestos contaminated soil from being tracked off site. The removal contractor will be required to construct a decontamination facility and asphalt paved roadway at the site to decontaminate equipment and vehicles. The equipment or vehicles to be decontaminated will be driven to the pad and washed with water from a source approved by the Government to remove visible signs of soil and mud from the exterior of the equipment or vehicle. The water will be collected for filtration and/or disposal in accordance with the removal contractor's approved Health and Safety Plan.

#### 3.1.5.4 Decontamination of Remaining Structures

Once the excavated asbestos contaminated soils stockpiled in the Long Shed have been removed, the removal contractor will perform a gross decontamination of the building. Following removal of the tunnel roofs, the tunnel walls and floor will be decontaminated prior to backfilling with compacted common fill approved by the Government. The removal action specifications provide procedures for gross decontamination of the buildings that include the use of HEPA vacuum cleaners, amended water, and/or rags and mops. Once a structure has been decontaminated and inspected by the air monitoring firm, the removal contractor will, when appropriate, spray a lock down encapsulant onto building surfaces to lock down any residual fibers.

#### 3.1.5.5 Dust Suppression Procedures

Continuation of the removal action will include dust suppression procedures to prevent asbestos contaminated dust from migrating off the removal action site. Consideration will also be given to controlling dust on Rainy Creek Road generated by trucks hauling waste to the abandoned mine site. The removal action specifications include requirements for dust suppression that include the use of liquid magnesium chloride dispensed by water trucks on the site and on Rainy Creek Road. Water spraying and misting will be required continuously during demolition/dismantling activities. CDM subcontractor PES will conduct visual observations and air monitoring of the site to monitor the effectiveness of the removal contractor's dust suppression techniques.

### 3.1.6 Supplemental Soil Sampling

In accordance with EPA directives, soil along the east bank of the Kootenai River bank will be sampled and analyzed for the presence of asbestos by the PLM method. Soil samples will be collected at approximately 50 foot intervals along the entire length of the Kootenai River bank, which is the western boundary of the Screening Plant property. GPS coordinates of each sample point will be obtained and, along with laboratory analytical results, entered into the project database. Sample results and visual observations will be used to determine areas along the riverbank where asbestos-containing soils exceed removal action criteria and require excavation and disposal. Excavated areas along the riverbank will be restored.

Similar soil sampling will be conducted along both the north and south banks of Rainy Creek. Soil samples will be collected at 50 foot intervals beginning at the concrete culvert under Highway 37 and continuing to the Kootenai River.

### 3.1.7 Riverbank and Rainy Creek Excavation and Stabilization

The removal contractor will be required to remove and dispose of asbestos contaminated soils from locations identified along the Kootenai River bank and Rainy Creek banks and restore the banks. The requirements for erosion control, contaminated soil excavation, placement of riprap and geotextile fabrics, backfilling with common fill and topsoil and slope stabilization are included in Specification Section 02271 and described in Subsection 3.2.10 of this RAWP. River and creek bank excavation, riprapping, bank restoration, and related work shall be completed in a manner acceptable to the Government.

### 3.1.8 Final Site Restoration

As discussed in Subsection 3.1.4 above, once the site restoration plans have been agreed upon by the Government and the property owners, final site restoration can be completed. It is anticipated that the removal contractor will provide assistance to CDM by excavating test pits and removing the permeable geotextile fabric and common fill in areas where septic tanks and leaching trenches to serve the property owners' proposed primary residence and guest house will be located. The removal contractor will be required to provide, place, and compact granular fill as specified in Specification Section 02200. All materials and installation in proposed leaching areas shall be, in all respects, acceptable to the Government. Other site restoration work is anticipated to include restoration of the riverbank and Rainy Creek banks, construction of gravel roads, installation of fencing, plantings, and other restoration work to be determined.

#### Soil Profile Description

Soil profile descriptions are required for separate subsurface sewage disposal systems for the property owners' primary residence and guest house. The removal contractor will provide a backhoe to excavate one test pit within the area of each proposed drainfield site. A second test pit will be excavated within the proposed expansion area at each location. Each test pit will be excavated to a minimum depth of 8 feet. Each test pit will be evaluated to provide a report on the following properties:

- Thickness of layers or horizons
- Texture, structure, and consistency of soil horizons
- Identification of soil color by the using the notation of the Munsell color scheme
- Depth of water, if observed
- Estimated depth to seasonally high ground water and basis for estimate
- Depth to and type of bedrock, if observed

- Percentage of the soil volume occupied by particles greater than 2 mm in diameter
- Plasticity
- Other prominent features such as roots, etc.

### Percolation Test

Properly conducted percolation tests are needed to determine each drainfield site's suitability and to properly size each drainfield. The results of the percolation test must support the soil profile of the test pit.

One percolation test will be performed within the area of each proposed drainfield site. A test hole 6 to 8 inches in diameter and dug to the depth of the proposed drainfield trenches will be utilized for each percolation test.

Each test hole will then be soaked in accordance with the percolation test procedure described in Appendix C. If the drainfield site consists of sandy soils, the soak time will most likely take less than 60 minutes. If the first 12 inches or the second 12 inches of water does not seep away within 60 minutes, the test hole will be presoaked for 4 hours. The soil then will be permitted to swell for a period of at least 12 hours.

After soaking the test hole, the percolation test will be performed. The procedure for the test will depend on the soil type. The pre-soaking procedures are described in Appendix C. The time to perform the percolation tests is dependent upon the soil type.

## 3.2 Removal Activities

### 3.2.1 Contractor Mobilization

The Volpe Center's removal contractor, MARCOR Remediation, Inc., is scheduled to mobilize to the Screening Plant site in mid-April 2001. MARCOR has planned to assign the same project superintendent and core support staff that worked at the Screening Plant site in 2000 to the project in 2001. Contractor mobilization includes setting up temporary facilities at the Screening Plant site similar to those provided in 2000.

### 3.2.2 Temporary Facilities

Temporary facilities will include a field office for MARCOR project superintendent and support team. A second field office trailer (60 feet x 14 feet) shall be provided for use by the EPA, Volpe Center staff, and CDM Federal Programs Corporation staff. Each office trailer shall be equipped with heat, air conditioning, lighting, and ventilation systems as required by local codes. Temporary field offices shall be secured from the effects of high winds by cable tie downs. Both the Government and the removal contractor's temporary field offices shall be furnished with three telephone lines for telephone communication and three additional telephone lines provided for facsimile transmissions and high speed modem connections. Restroom facilities will be provided within the field office trailers as well as portable units augmented with hand washing stations. Portable toilets for male and female workers and agency personnel shall be staged in the Support Zone and workers must exit through the personnel decontamination facility in order to access these facilities. The number of toilet seats and urinals shall be in accordance with the requirements of 29 CFR 1910.120(n)(3)(I), however, there shall be at least three portable toilets with hand washing facilities at Operable Unit 02. Portable toilets shall be emptied and cleaned, and liquids, disinfectants, paper, etc. replaced or resupplied every other day during the removal activities. The removal contractor will provide cleaning services and rubbish removal on a daily basis.

### 3.2.3 Decontamination Facilities

The removal contractor shall provide personnel decontamination facilities of sufficient size to provide adequate room for employees working in the exclusion zone to change clothes, shower, and redress throughout the duration of the project. Personnel decontamination facilities shall be provided with heat, ventilation, hot water, and clean towels at all times. Personnel decontamination facilities shall meet all applicable OSHA requirements.

Vehicle and equipment decontamination facilities shall be constructed in a location approved by the Government. Vehicle and equipment decontamination facilities shall be of sufficient size to thoroughly wash down the largest piece of equipment used on the site.

### 3.2.4 Dispose of Stockpiled Demolition Debris

Items removed from structures in 2000 and resultant debris from demolition of these structures has been stockpiled on the Screening Plant site. The structures demolished in 2000 are listed in Section 2 above. The 2000 RAWP indicated that demolition debris would be disposed at the abandoned mine site. However, EPA and Government contractors were denied access to the mine site by the property Owners. A recent court order has granted EPA and Government contractors access to the mine site for disposal of this debris.

The demolition debris, contents of structures selected for disposal, and steel storage tanks and hoppers remaining from the Screening Plant operation will be reduced to manageable size and transported by truck to the abandoned mine site and disposed. Disposal will be at a location approved by the Government, and in accordance with the approved Transportation and Disposal Plan developed for the Volpe Center by CDM, and currently under review by the Government.

### 3.2.5 Dispose of Stockpiled Soil

As described in Subsection 3.1.4 above, asbestos-containing soils excavated from the north portion of the Screening Plant site were also stockpiled on site due to access restrictions to the mine site. Excavated soils have been stockpiled in and around the Long Shed and covered with tied down and weighted down polyethylene sheeting through the winter shutdown. The stockpiled soil will be transported by truck to the abandoned mine site and disposed at a location approved by the Government, and in accordance with the approved Transportation and Disposal Plan.

### 3.2.6 Soil Excavation and Disposal

Once stockpiled soils have been removed from in and around the Long Shed, excavation of asbestos-containing soils on the remainder of the Screening Plant site will begin. Figure 3-1 shows the approximate limits of soil excavation completed on the site in 2000 and soil excavation area planned for the 2001 construction season. Asphalt pavement will be removed and reduced to manageable size pieces for loading and truck transport to the mine site for disposal. Soil will be excavated to a depth of 4 feet below existing grade. A 100 foot x 100 foot sampling grid will be established and post excavation samples will be collected and analyzed using the PLM Method. GPS coordinates of each sample point and corresponding analytical results will be entered into the project database. The excavated soil will be transported by truck to the abandoned mine site and disposed in accordance with the approved Transportation and Disposal Plan.

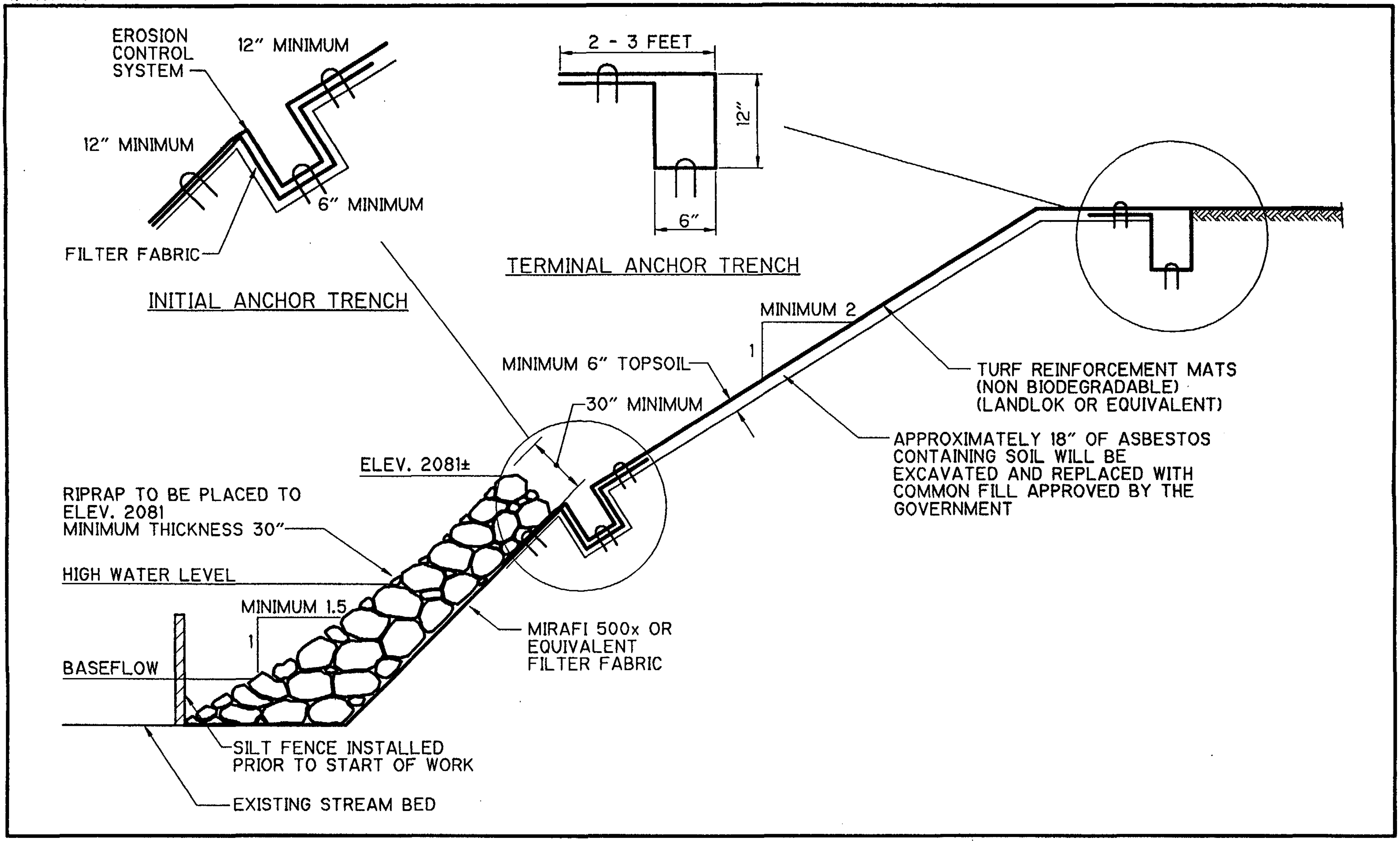
### 3.2.7 Demolition and Dismantling of Structures

Once stockpiled soils have been removed from inside and around the Long Shed, this structure will be decontaminated and dismantled. Steel storage tanks and hoppers remaining from the Screening Plant operations will also need to be removed from behind the Long Shed and disposed. Structural steel members, corrugated metal roofing panels, steel tanks and hoppers will be sheared into pieces of a size suitable for readily loading into trucks and transported to the abandoned mine site for disposal.

Reinforced concrete walls of the Long Shed shall be removed to the elevation of the Long Shed floor slab. The floor slab shall remain. Other reinforced concrete structures, such as the foundation slab upon which the office and residence were constructed and various foundations which supported Screening Plant process operations, shall be removed to 5 feet below finished grade.

Roofs of all reinforced concrete tunnels will be removed and tunnel walls removed to 5 feet below finished grade. All reinforced concrete demolition debris shall be broken up into pieces of a size suitable for readily loading into trucks and transported to the abandoned mine site for disposal. The tunnels will then be decontaminated and backfilled with compacted common fill meeting the requirements of Specification

C:\4000\FIG3-1

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**Former Screening Plant Property**
**(Operable Unit 02)**
**Libby, Montana**

**Figure 3-1**
**River Bank Restoration Detail**

Section 02200 and all Government requirements. All demolition and dismantling operations shall be carried out in a manner such that no visible dust is observed or particulates detected by daily perimeter air sampling.

### 3.2.8 Backfilling and Compaction

Backfill material shall meet the requirements of Specification Section 02200 for common fill and gravel road base and surface course and be in all respects approved by the Government. Backfill shall be placed in 12 inch and 6 inch lifts as specified and compacted in accordance with Specification Section 02200. Troxler density tests shall be performed on each layer of common fill placed and compacted on the site. Final grades shall be in accordance with drawing entitled Site Restoration Plan – North Sheet No. C-14A and Site Restoration Plan – South Sheet No. C-15A as approved by the Government and property owners.

### 3.2.9 Topsoil and Hydroseeding

Once common fill has been placed, compacted, and accepted by the Government, 6 inches of topsoil shall be placed over all disturbed areas. Topsoil shall meet the requirements of Specification Section 02200 and be in all respects acceptable to the Government. All areas receiving topsoil shall be hydroseeded with a mixture of native grasses and vegetation in all respects acceptable to the Government and property owners. The removal contractor shall be responsible for watering, mowing, and fertilizing seeded areas until a uniform growth of grass has been firmly established on the site.

### 3.2.10 River and Creek Bank Excavation and Restoration

In areas along the Kootenai River bank determined to contain asbestos contaminated soils requiring removal, erosion controls will be installed, contaminated soils excavated and disposed, common fill and riprap placed and the riverbank restored. Refer to Figure 3-1 for details of soil excavation, backfill, riprap and riverbank restoration. Prior to starting any excavation, a silt screen will be installed in the river and anchored to the river bottom. Vegetation will be removed, the bottom third of the riverbank graded and the specified geotextile fabric installed and anchored. A minimum depth of 18 inches riprap meeting the specified State of Montana DOT requirements will be placed from the river bottom to elevation 2,081. In portions of the riverbank above elevation 2,081, asbestos contaminated soils will be removed to a maximum depth of 18 inches. The excavated area will be backfilled with one foot of common fill accepted by the Government, geotextile fabric installed and anchored and 6 inches of topsoil placed and covered with the specified slope stabilization fabric. Technical Specification Section 02271 includes material and installation requirements for erosion control, riprap, excavation and restoration of the riverbank.

### 3.2.11 Final Site Restoration

CDM understands that EPA will continue to work with the property owners to restore the former Screening Plant site to a condition suitable for constructing a primary residence and guest house on the property. Preliminary drawings entitled Site Restoration Plan – North Sheet No. C-14A and Site Restoration Plan – South Sheet No. C-15A have been provided to the property owners for acceptance and signature. Copies of these drawings are provided in Appendix B. Once the locations of the residential structures, gravel roadways, and various other restoration details have been agreed upon between the Government and the property owners, the site restoration drawings can be finalized.

In order to expedite the anticipated construction of residential structures in locations identified by the property owners, CDM has prepared a Flood Contour Redesignation Application for the property owners to submit to FEMA. This application is currently under review by FEMA. Once FEMA grants the request for redesignation of the flood contour at this site, CDM, with assistance from the removal contractor, will excavate test pits so that soils stratification and characteristics can be determined in locations for subsurface sewage disposal systems. Percolation tests will need to be performed in these locations as well. Soil characterization and percolation tests will be performed in accordance with State of Montana and Lincoln County regulations.

# Section 4
# Quality Assurance/Quality Control

## 4.1 General Requirements

Appendix B "Text Portion of Sampling and Quality Assurance Project Plan Developed by EPA" provides the basic quality assurance (QA) requirements associated with tasks conducted at the various Libby sites. The overall site DQOs are discussed in detail. The project task description (Section A5) states that media samples will be collected according to Standard Operating procedures provided by CDM, or as provided in the attachments to the Sampling and Quality Assurance Plan. Specific QA/QC requirements for the Screening Plant are discussed in the following section.

## 4.2 Specific Requirements

Appendix B provides an overall QA/QC plan for conducting and reporting activities at the various Libby sites. For Screening Plant activities, CDM's technical standard operating procedures (TSOPs) will be implemented as necessary. Basic requirements include such tasks as general site documentation, sampling of various media, records of deviations from standard procedures and protocols including the EPA's Sampling and Quality Assurance project Plan, custody control, sampling handling and storage, and document control. Specific procedures have also been generated for calibration and maintenance of field instruments.

As stated previously, specific sampling requirements have not been completed at this time. Once specific locations and numbers of samples and QC samples have been determined, with input and concurrence from the client, the pertinent information will be recorded in applicable site logbooks, forms or equivalents to ensure events, decisions, and situations can be reconstructed from the entries. Miscellaneous requirements are addressed by the approved Transportation and Disposal Plan.

# Appendix A

# Text Portion of Sampling and Quality Assurance Project Plan Developed by EPA

# SAMPLING AND QUALITY ASSURANCE PROJECT PLAN
# REVISION 1

## FOR

## Libby, Montana

## Environmental Monitoring for Asbestos

***Baseline Monitoring for Source Area and Residential Exposure to Tremolite-Actinolite Asbestos Fibers***

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**Paul Peronard , OSC**
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# DOCUMENT REVISION LOG

| Revision | Date | Major Changes |
|---|---|---|
| 0 | 12/6/99 | – |
| 1 | 1/4/00 | a. Revised text to clarify study design and DQOs<br>b. Added SOP for surface water to allow collection and evaluation of surface water as a transport medium<br>c. Added alternative SOP for asbestos analysis in soil that may have higher sensitivity than other methods.<br>d. Added figures to help illustrate key steps from sample collection to analysis<br>e. Added final SOPs as appendices to the revision. |

# Table of Contents

# A. PROJECT TASK ORGANIZATION

## A3 PROJECT MANAGEMENT

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Medical Coordinator for Environmental Emergencies and Hazards
U.S. Public Health Service Region 8 and
USEPA Region 8

## A4 PROBLEM DEFINITION and BACKGROUND

Problem: This sampling plan has been developed in response to requests from the State of Montana, Lincoln County Health Board (meeting minutes, 11/23/99), and City officials of Libby, MT, to address questions and concerns raised by citizens of Libby regarding possible ongoing exposures to asbestos fibers as a result of historical mining, processing and exportation of asbestos-containing vermiculite. Over 60 years of mining, milling, packaging and shipping of vermiculite at the mine and associated properties resulted in the environmental release of asbestos fibers during mining operations (McDonald et al., 1986; Amandus et al., 1987; Amandus and Wheeler; 1987; Amandus et al., 1978). Since closure of the mine in 1990, it is expected that production-related emissions have been greatly reduced or eliminated.

However, there are presently insufficient data to conclude that current exposures to residents in Libby and the surrounding area and occasional recreational visitors to the former mining areas are negligible. ***The purpose of this sampling effort is to acquire information suitable for supporting an exposure and risk assessment for current environmental conditions in Libby.***

Background: Asbestos is a generic term for a group of six naturally-occurring, fibrous silicate minerals that have been widely used in commercial products. Asbestos minerals fall into two groups or classes: serpentine asbestos and amphibole asbestos. Serpentine asbestos, which includes the mineral chrysotile, a magnesium silicate mineral, possesses relatively long and flexible crystalline fibers that are capable of being woven. Amphibole asbestos, which includes the minerals amosite, crocidolite, tremolite, anthophyllite, and actinolite, form crystalline fibers that are substantially more brittle than serpentine asbestos.

Asbestos is of potential health concern because chronic inhalation exposure to excessive levels of asbestos fibers suspended in air can result in lung disease such as asbestosis, mesothelioma, and lung cancer. Figure 1 presents a preliminary Site Conceptual Model which identifies exposure pathways by which asbestos fibers from mining-related sources might become entrained in air in Libby, leading to inhalation exposures of residents or workers. The site conceptual model will be refined as site data are acquired and an improved understanding of actual transport and exposure pathways is achieved.

Approach: This sampling plan describes the efforts planned by EPA to monitor and characterize asbestos-containing materials in and about the vicinity of Libby. The plan will be composed of two phases:

Phase 1: This is a rapid pilot-scale investigation that has two main objectives:

a) Obtain information on airborne asbestos levels in Libby in order to judge whether a time-critical intervention is needed to protect public health.

b) Obtain data on asbestos levels in potential source materials, and identify the most appropriate analytical methods to screen and quantify asbestos in source materials.

Phase 2: This will consist of a systematic evaluation of asbestos levels in air in Libby and in appropriate background locations, along with a systematic investigation to identify the actual or potential source(s) and release mechanism(s) of asbestos in Libby and the surrounding area. The implementation, pace and scope of Phase 2 and the methods used to collect and analyze samples in Phase 2 will be determined in large part by the results of the Phase 1 pilot study.

Interpretation. Analyses of asbestos fibers in air and other site media will determine the potential (or lack of potential) for human inhalation exposure under **present** conditions. The environmental fate and transport of asbestos fibers may be such that present measurement conditions (e.g. weather) and/or measurement techniques interfere with the ability to identify and/or quantify asbestos fibers in relevant exposure media (soil, dust, air, or water). Thus, while conclusions drawn from the implementation of this study are applicable to the present conditions at the site, they do not necessarily reflect conditions which may develop in the future.

# A5 PROJECT TASK DESCRIPTION

To the extent possible, sampling will be conducted such that data will be meaningful for human exposure and risk assessment. Because the chief exposure pathway is air, emphasis will be placed on collection of air samples. In addition, to help identify potential sources and transport pathways for asbestos, samples of various bulk materials (mine waste, soil, dust, water, sediment) will also be collected in residential and non-residential areas.

## Phase 1

Basic tasks needed to complete Phase 1 are listed below:

1. Collect samples of air, soil, dust, water, and insulation from selected locations in and around town, including a number of residential and/or commercial locations, as well as suspected source areas such as historical mining/processing/loading facilities.

2. Perform asbestos analyses on all air samples and a selected set of the dust, soil, insulation and water samples (those judged to be most likely to have either "high" or "low" concentrations) in order to obtain preliminary information on asbestos levels in air and other media, and to identify the optimum conditions for collection and analysis of bulk media.

At this time, the proposed sampling for Phase 1 consists of collection of environmental media from approximately 30 residences and 3 potential source areas. Residential sample locations will be selected from residences volunteering for multimedia sampling. In addition to the collection of samples within the residential area, samples may also be collected in commercial warehouses, agricultural buildings, or businesses in Libby, as needed to support the objectives of the On Scene Coordinator. Potential source area samples will be collected along the mine road (Rainy Creek Road) and at the Former Vermiculite Loading facility near the intersection of Rainy Creek Road and Highway 37.

Media samples will be collected according to Standard Operating Procedures provided by CDM, Inc. or as provided in the attachments to this Sampling and Quality Assurance Plan.

## Phase 2

The purpose of Phase 2 is to design and implement a systematic program of sample collection and analysis to fully characterize levels of health risk from long-term inhalation exposure to asbestos in air, and to identify any actual or potential sources and release mechanisms of asbestos. Specific tasks needed to implement Phase 2 will be selected after completion of Phase 1.

## A6 QUALITY OBJECTIVES and CRITERIA for MEASUREMENT DATA

Two types of objectives are identified in this quality assurance project plan (QAPP): general objectives and data quality objectives (DQOs). General objectives are statements of practical goals that, if realized, will substantially contribute to achieving the purpose of the study. Development of DQOs is a process that is intended to ensure that task objectives are clearly defined and that data collected are appropriate and of sufficient quality to satisfy the objectives.

<u>Phase 1 General Objective 1</u>

*Determine whether current airborne levels of asbestos in Libby are high enough to warrant a time-critical intervention.*

<u>Phase 1 General Objective 2</u>

*Obtain preliminary data on asbestos concentrations in potential source materials for air (e.g., dust, soil, mine waste), and determine the optimum conditions for sampling and quantifying asbestos levels in source materials.*

<u>Phase 2 General Objective</u>

*The general objectives for Phase 2 is to collect reliable and systematic data on asbestos levels in air and other media in Libby to allow a reliable evaluation of current human exposure and health risk from asbestos as well as an identification of sources of unacceptable levels of asbestos in air.*

<u>Data Quality Objective Process</u>

The DQO process can be an iterative process which is designed to focus on the decisions that must be made and to help ensure that the site activities that acquire data are logical, scientifically defensible, and cost effective. The DQO process is intended to:

- Ensure that task objectives are clearly defined
- Determine anticipated uses of the data
- Determine what environmental data are necessary to meet these objectives
- Ensure that the data collected are of adequate quantity and quality for the intended use

The three stages of the DQO process are identified below and a discussion of how they have been applied in the characterization study described herein. The three stages are undertaken in an interactive and iterative manner, whereby all the DQO elements are continually reviewed and re-evaluated until there is reasonable assurance that suitable data for decision making will be attained.

- Stage I - Identify Decision Types: Stage I defines the types of decisions that will be made by identifying data uses, evaluating available data, developing a conceptual model, and specifying objectives for the project. The conceptual model facilitates identification of decisions that may be made, the end use of the data collected, and the potential deficiencies in the existing information.

- Stage II - Identify Data Uses/Needs: Stage II stipulates criteria for determining data adequacy. This stage involves specifying the quantity and quality of data necessary to meet the Stage I objectives. EPA's Data Usability for Risk Assessment Guidance (DURA) outlines general and specific recommendations for data adequacy. This includes identification of data uses and data types, and identification of data quality and quantity needs.

- Stage III - Design Data Collection Program: Stage III specifies the methods by which data of acceptable quality and quantity will be obtained to make decisions. This information is provided in the SOP.

Through utilization of the DQO process, as defined in EPA guidance (EPA540-R-93-071 and -078, Sep 1993), this QAPP will use several terms that are specifically defined to avoid confusion that might result from any misunderstanding of their use. For each of the tasks identified within this QAPP, a "Task Objective" is specifically defined. The Task Objective is a concise statement of the problem to be addressed by activities under this task. For each Task Objective, a decision (or series of decisions) is identified which addresses the problem contained in the Task Objective.

For each decision, the data necessary to make the decision are identified and described. For all analytical data, quality assurance objectives are specified that describe the minimum quality of data necessary to support the specified decision or test the hypotheses. These quality assurance objectives are specified as objectives for precision, accuracy, representativeness, comparability, and completeness. In addition, data review and validation procedures are specified in the QAPP that evaluate how well the analytical data meet these quality assurance objectives and whether or not the data are of sufficient quality for the intended usage.

The following sections apply the DQO process to the Libby Project, Stage I and Stage II. Stage III is discussed later (see Section B), but sampling and analysis methods presented in this section are considered tentative and final decisions on optimum sampling and analytical methods will be delayed until the findings of Phase 1 are available.

**DQO Stage I - Identifying Decision Types**

Stage I of the DQO process identifies a primary question and secondary questions that need to be resolved at the completion of the sampling and analyses program.

- PRIMARY QUESTION (Phase 1): Are current airborne levels of asbestos sufficiently high to warrant a time-critical intervention?
- SECONDARY QUESTION (Phase 1): What are the most likely sources of asbestos in air, and what are the best methods for quantifying asbestos levels in potential source materials?

## DQO Stage II - Identifying Data Uses/Needs

Stage II of the DQO process also determines what type and quality of data are needed to answer the questions developed in Stage I. EPA has developed a seven-step method for developing the DQOs. This seven-step method is applied below in order to define the data requirements needed to achieve the primary and secondary objectives of the Phase 1 evaluation (and summarized in Table 1).

***Primary Objective: Evaluate The Need For Time-critical Action***

### 1. State the Problem

The problem to be addressed by this study is that citizens of Libby appear to have an increased incidence of asbestos-related disease, but there are no data to determine if this disease is attributable solely to historic exposures, or whether current exposures are of continuing health concern.

### 2. Identify the Decision

The first decision to be made is whether or not time-critical intervention is needed to protect public health. If current exposures are not high enough to warrant time-critical intervention, the next decision is whether or not non-time-critical remedial action is needed.

### 3. Identify Inputs to the Decision

Decisions on the need for time-critical intervention or non-time-critical remediation will be based on estimated risk of lung disease in current residents and workers in Libby. Two types of lung disease are of concern: asbestosis (a non-cancer effect) and lung cancer and mesothelioma (cancer effects). Limited data suggest that chronic exposures to chrysotile fiber levels of 5-20 f/mL can cause asbestotic changes (ATSDR 1999), but data are not sufficient to derive a reliable chronic MRL or RfC for asbestosis. However, methods have been established for estimating the excess risk of lung cancer and/or mesothelioma, and it is considered likely that exposure levels that protect against unacceptable risk of lung cancer/mesothelioma (in the range of 0.1 to 0.0001 f/mL; see below) will also protect against unacceptable risk of asbestosis.

The basic equation used to estimate cancer risk is:

Risk = Concentration (f/mL) * Unit Risk (risk per f/mL)

Thus, the data needs are an **estimate of airborne asbestos concentration** and an **estimate of cancer risk per unit concentration.**

*Measurement of Asbestos Concentration in Air*

There are a number of techniques for measuring asbestos fibers in air, all of which are based on visual identification of structures as asbestos fibers. Most historical human health data and many regulatory limits for asbestos exposure in air are based upon asbestos fiber concentrations measured using phase contrast microscopy (PCM) (see Table 2). In this method, **fiber material** is defined as having a length >5 microns and an aspect ratio (length to diameter ratio) of three or more. Results are generally reported as fibers per milliliter of air (f/mL).

More recently, a number of other methods have been developed for quantitative or qualitative measurement of asbestos fibers in air, including transmission electron microscopy (TEM), and x-ray diffraction (XRD). These methods are generally more sensitive than PCM, and also allow visualization and quantification of asbestos fibers that are thinner than those visible under PCM. This is important because it is likely that the toxicity of long thin fibers is greater than that of shorter thicker fibers (Berman et al., 1995). Based on this, **asbestos fibers in air will be quantified by TEM.** Detailed rules for identifying asbestos fibers of biological concern by TEM are provided in ISO method 10312. This method is an international standard procedure that is recommended for quantifying asbestos fibers that are believed to be the chief source of human health concern (Berman and Crump 1999).

*Unit Risk for Asbestos in Air*

It is mandatory that the unit risk value used to calculate cancer risk be based on the same type of asbestos measurement technique as used to quantify asbestos concentration in air. That is, it is not correct to estimate risk by multiplying a concentration based on TEM fibers per mL by a unit risk based on PCM fibers per mL. Thus, risk-based values shown in Table 2 cannot be used to interpret measurements based on TEM. EPA has developed a model for predicting risk from mesothelioma and lung cancer from TEM-based measurements of asbestos in air (USEPA 1986), and this method has been revised and improved by Berman and Crump (1999) to incorporate the influence of fiber length. The risk factors for the modified mesothelioma and lung cancer model are summarized in Table 3. Note that the risk factor depends not only on the number of TEM fibers greater than 5 um in length, but also on the fraction of all fibers that are longer than 10 um.

The toxicity factors shown in Table 3 are based on the best data currently available, but it is important to recognize that these toxicity factors are uncertain. This is because the values are derived from studies in which important details of exposure (level, duration, fiber size distribution, etc.) are not always known. In particular, the importance of fiber size (length, thickness) and fiber type (tremolite, chrysotile, etc.) on toxicity is difficult to quantify and remains a source of discussion.

## 4. Define the Study Boundaries

*Spatial Bounds*

The spatial bounds to be investigated in this project include the community of Libby, and areas associated with former mining activities near the town. Appropriate background areas may be selected for comparative evaluation.

*Temporal Bounds*

Asbestos fibers enter air mainly as a result of resuspension due to mechanical disturbance or wind erosion. Because mechanical and wind forces may vary substantially over time, asbestos levels in air are also expected to vary substantially over time. Thus, estimates of long term average concentrations are inherently preferable to measurements based on grab samples. Therefore, multiple samples of air will be collected over time at locations of interest. It is likely the highest levels will tend to occur in summer, when source areas tend to be dry and wind and mechanical forces result in significant dust resuspension.

## 5. Develop a Decision Rule

EPA must identify an actual or potential threat to human health or the environment in order to initiate a time-critical intervention at a site. Based on current EPA guidelines, a lifetime excess cancer risk of 1E-04 is considered to be at the upper end of the acceptable risk range for chronic (lifetime) exposure. Based on this, this Phase 1 study will use an excess cancer risk of about 1E-03 as the appropriate boundary for decision-making. That is, if asbestos levels in air correspond to an estimated cancer risk of about 1E-03 or higher, time critical actions to identify sources and find appropriate and effective interventions will be considered. If estimated cancer risks from asbestos in Phase 1 air samples do not exceed a level of about 1E-03, then further studies may be pursued to determine if risk levels might exceed 1E-03 at other times or in other places, or if risks might exceed an acceptable chronic risk level (e.g., 1E-04).

## 6. Specify Limits on Decision Errors

The null hypothesis that will be tested in Phase 1 is that indoor air levels in Libby are sufficiently high to warrant time-critical intervention. Two types of decision error are possible when making this decision:

Type I Error: Rejecting the null hypothesis when it really is true. That is, the site is declared to be below a risk level of 1E-03 when it is really above this level.

Type II Error: Accepting the null hypothesis when it actually is false. That is, the site is declared to be of time-critical concern when it actually is not.

The limits on these two types of errors are risk management judgements. In order to minimize the chances of a Type 1 error ( a "false negative"), the decision will be based on the highest concentration of asbestos fibers detected in any currently-occupied residential or occupational building evaluated in the Phase 1 investigation. If one or more samples exceeds the 1E-03 risk level, time critical action may be needed. However, additional samples may be collected to confirm the original measurement and to refine the risk estimate. Because of the time variability in asbestos levels in air, final decisions may be delayed until additional data have been collected, including data in the summer when airborne resuspension and transport of asbestos fibers in outdoor air is considered to be more likely than in winter.

### 7. Optimize the Design for Obtaining Results

Additional indoor and/or outdoor air samples may be collected and incorporated into either Phase 1 and/or Phase 2 as data become available on actual airborne exposure and risk levels.

***Secondary Objective: Preliminary Investigation of Source Materials***

Table 4 provides a summary of the seven-step DQO process for achieving the secondary objective. The following text describes each of the DQO steps in detail.

### 1. State the Problem

The problem to be addressed by this portion of the study is that most methods currently available for measuring asbestos in solid materials (e.g., soil, dust, bulk insulation, mine waste, etc.) are relatively insensitive, and it is not known whether impacts of historic or ongoing asbestos releases on these media can be detected by these techniques.

### 2. Identify the Decision

The decision to be made is whether analysis of potential source materials and/or transport media in and about the mine (e.g., mine waste, surface water) and in and about the community of Libby (e.g., yard soil, house dust, garden soil) can be reliably quantified using available techniques. If so, then source areas judged to be of potential concern may be removed at the discretion of the OSC. Alternatively, additional sampling and analysis of potential source material may be pursed as needed to identify impacted areas and to focus on sources of unacceptable asbestos levels in air.

## 3. Identify Inputs to the Decision

*Asbestos Measurements in Environmental Media*

Inputs to the decision will be the results of asbestos analyses of each medium using the best available technique(s), as follows:

| **Medium** | **Proposed Method** | |
|---|---|---|
| | **Sample Preparation** | **Sample Analysis** |
| Yard soil<br>Garden soil<br>Road soil<br>Mine waste<br>Bulk insulation | Collect bulk sample, place on slide | PLM of bulk material |
| | Collect bulk sample, dry | Visible reflective infrared spectroscopy |
| | Separate respirable dust fraction using Superfund method, collect dust on filter, collapse filter, prepare TEM grids | TEM of respirable dust |
| Indoor Dust | Microvacuum into cassette, suspend dust in water/alcohol, collect on filter, dry ash, prepare TEM grids | TEM |
| Surface Water | Collect bulk sample, filter, collapse filter, prepare TEM grids | TEM |

These methods have been selected because they are judged to be the most likely to yield results that will allow qualitative or quantitative evaluation of asbestos levels in environmental media. Note that several alternative methods are identified for soil and related bulk materials. At present, it is not known which of these will be the most appropriate. It is envisioned that all samples will be screened using visible infrared spectroscopy, since this method is very fast and inexpensive. If successful, the results of this method can be used to rank-order samples into "high", "medium" and "low" concentration ranges. For quantitative assessment, it is envisioned that all samples will be analyzed by PLM, since this method is fast and relatively less expensive than the Superfund TEM method. This evaluation will begin with samples that are known or suspected to be high in asbestos concentration, based either on the infrared results and/or field observations such as the presence of visible levels of vermiculite, proximity to known sources or waste materials, etc. The analyses will continue through the samples to those that are known or suspected to contain "low" levels. When asbestos fiber concentrations are consistently below the detection limit, further analyses by PLM may be discontinued. After the results of the infrared and the PLM analyses are available, a set of samples will be selected for analysis by the Superfund method. This method is expected to be the most sensitive, because it includes a preliminary separation of respirable asbestos fibers from the bulk material, and because quantification is by TEM rather than PLM. However, the method is not yet in wide use, and is associated with a relatively high cost and slow turnaround time. It is for this reason that only about 15-21 samples will be evaluated by this approach. This set will be composed of approximately 5-7 in each of three categories: "high", "medium", and "low". Comparison of results across these three methods will allow an evaluation of which method(s) is (are) most appropriate for on-going evaluation of soils and related materials at the site.

For the other media (dust, surface water), all samples collected will be analyzed by the analytical methods indicated above. A comparison of results across samples will be used to determine whether the method is likely to be reliable and useful for further evaluation of site samples.

*Community Interview*

EPA will administer a community interview to numerous Libby residents including residents of each household sampled. These interviews will help gauge community members' level awareness about asbestos, their health concerns about asbestos, their knowledge about activities that may results in asbestos exposure, as well as possible sources of asbestos-bearing material. This information may help explain observed asbestos levels in samples from the home. A copy of the interview questionnaire is provided in Section E (Appendices).

## 4. Define the Study Boundaries

*Spatial Bounds*

The spatial bounds to be investigated in this project include the community of Libby, and areas associated with former mining activities near the town.

*Temporal Bounds*

Asbestos levels in source or transport material are expected to be relatively stable. Thus, the time when source area samples are collected is not judged to be critical.

## 5. Develop a Decision Rule

If no observable difference in asbestos concentration can be detected between the two classes of samples ("high" vs "low"), it will be concluded that a) either the medium is not impacted, or b) the measurement technique is not sufficiently sensitive. If a difference can be detected, it will be concluded that there is an impact to that medium, along with an actual or potential release to the environment, and that the current method can be used to further investigate and quantify that release.

## 6. Specify Limits on Decision Errors

Because the decision to be made is mainly with regard to method adequacy, no quantitative rules are needed to define decision errors.

## 7. Optimize the Design for Obtaining Results

Additional source area samples may be collected and incorporated into either Phase 1 and/or Phase 2 as data become available on the ability of current methods to detect and quantify asbestos fibers in each medium.

### PARCC Requirements

Within this QAPP, quantitative and qualitative limits are defined for precision, accuracy, representativeness, comparability and analytical completeness. Reporting limits for asbestos fibers are set by the analytical laboratory based on environmental matrix, historical data, and comparison to EPA limits for CLP and other methods. Quantitative limits are also defined by microscopy (light microscopy or TEM) for method detection limits, and for method reporting limits or method quantitation limits. The QA procedures outlined in this section are intended to ensure data quality and to administer corrective actions with the goal of producing data that satisfy the following requirements. General guidelines, policies, and procedures to achieve these objectives are presented below. Where additional, detailed, procedures are required to attain QA objectives and to describe specific methods, these are provided in the SOPs (see attached). The following PARCC requirements apply to more standard chemical analytical analyses, and partially to asbestos analyses (e.g., identifying physico-chemical make-up of specific fibers)

Precision: Precision is defined as the agreement between a set of replicate measurements without assumption or knowledge of the true value. It is a measure of agreement among individual measurements of the same property under prescribed similar conditions. Agreement is expressed as either the relative percent difference (RPD) for duplicate measurements or the range and standard deviation for larger numbers of replicates. The RPD will be reported on required 5% laboratory duplicates.

Accuracy: Accuracy is a measure of the closeness of individual measurements to the "true" value. Accuracy usually is expressed as a percentage of that value. For a variety of analytical procedures, standard reference materials traceable to or available from National Institute of Standards and Technology (NIST, formerly National Bureau of Standards) or other sources can be used to determine accuracy of measurements. Accuracy will be measured as the percent recovery (%R) of an analyte in a reference standard or spiked samples (>3 at each selected concentration range) that span the limit of linearity for the method.

Ideally, precision and accuracy estimates should represent the entire measurement process, including sampling, analysis, calibration, and other components. From a practical perspective, these estimates usually represent only a portion of the measurement process that occurs in the analytical lab.

Representativeness: Representativeness is the degree to which data accurately and precisely represent characteristics of a population, parameter variations at a sampling point, or an environmental condition. For this QAPP, data and samples representative of chemical and biological exposures in the study and reference areas are to be collected from randomly chosen residences.

Comparability: Data are comparable if site considerations, collection techniques, and measurement procedures, methods, and reporting are equivalent for the samples within a sample set. A qualitative assessment of data comparability will be made of applicable data sets. These criteria allow comparison of data from different sources. Comparable data will be obtained by specifying standard units for physical measurements and standard procedures for sample collection, processing, and analysis. Please see the attached SOPs for sampling and analysis procedures.

Completeness: Data are considered complete when a prescribed percentage of the total intended measurements and samples are obtained. Analytical completeness is defined as the percentage of valid analytical results requested, and >90% of analyzed samples should have results reported. For this sampling program, a minimum of 80 percent of the planned collection of individual samples for quantification and a minimum of 30 percent of related parameters (e.g., physical measurements, fiber type, etc.) must be obtained to achieve a satisfactory level of data completeness.

Method Detection Limits (applicable to chemical analyses only): Method detection limits (MDLs) are minimum values that can be reliably measured to identify the analyte as being present in the matrix, versus method quantitation limits are the minimum values that can be quantitated with reasonable scientific confidence. The method will also have a maximum linear value in most situations, and analyses should occur within this limit of linearity range. See applicable operating procedures for details.

**Table 1. DQOs for Primary Objective: Evaluate the Need for Time-Critical Action**

| DQO Step | Description |
|---|---|
| 1. Define the problem | The citizens of Libby appear to have an increased incidence of asbestos-related disease, but there are no data to determine if this disease is attributable solely to historic exposures, or whether current exposures are of continuing health concern. |
| 2. Identify the decision | Is time-critical action needed to protect public health?<br>If yes, identify appropriate action and intervene as necessary<br>If no, determine whether or not non-time-critical remediation is necessary |
| 3. Identify inputs to decision | Level of concern for human health (lifetime excess cancer risk of 1E-03)<br>Estimate of airborne asbestos concentration, and cancer risk per unit concentration. |
| 4. Define study boundaries | *Spatial bounds*: Community of Libby, including former mining, milling and processing areas and areas potentially impacted as defined by meteorological conditions. If necessary, appropriate background areas are also included (precise locations to be defined).<br>*Temporal bounds*: multiple air samples will be collected in areas associated with former mining activities near the town seasonally throughout the year |
| 5. Define decision rule | If asbestos levels in indoor air ≥ 1E-03 risk level, consider the need for time-critical intervention.<br>If asbestos levels in indoor air < 1E-03 risk level, time-critical intervention may not be necessary. However, additional studies may be needed to determine if non-time-critical remediation is necessary, or if levels might exceed 1E-03 risk levels under different conditions (e.g., seasonal variation) |
| 6. Specify limits on decision errors | Risk management decisions will be based on the highest airborne asbestos concentration found in any residential or occupational building. |
| 7. Optimize the design | Incorporate new information as data become available on actual airborne exposure and risk levels. |

## TABLE 3. Unit Risk for Inhalation of Asbestos

| Population | Percentage of Fibers Greater than 10 um in Length | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.50% | 1% | 2% | 4% | 6% | 10% | 15% | 20% | 30% | 40% | 50% |
| **Male Nonsmoker** | | | | | | | | | | | |
| Lung Cancer | 1.0E-02 | 1.6E-02 | 3.0E-02 | 5.4E-02 | 8.0E-02 | 1.3E-01 | 1.9E-01 | 2.6E-01 | 3.8E-01 | 5.0E-01 | 6.4E-01 |
| Mesotheliomas | 1.1E-01 | 1.9E-01 | 3.2E-01 | 6.2E-01 | 9.0E-01 | 1.5E+00 | 2.2E+00 | 2.9E+00 | 4.3E+00 | 5.8E+00 | 7.2E+00 |
| Total | 1.2E-01 | 2.0E-01 | 3.5E-01 | 6.7E-01 | 9.8E-01 | 1.6E+00 | 2.4E+00 | 3.2E+00 | 4.7E+00 | 6.3E+00 | 7.8E+00 |
| **Female Nonsmoker** | | | | | | | | | | | |
| Lung Cancer | 7.6E-03 | 1.2E-02 | 2.2E-02 | 4.0E-02 | 6.0E-02 | 9.6E-02 | 1.4E-01 | 1.9E-01 | 2.8E-01 | 3.8E-01 | 4.8E-01 |
| Mesotheliomas | 1.3E-01 | 2.0E-01 | 3.6E-01 | 6.8E-01 | 1.0E+00 | 1.7E+00 | 2.5E+00 | 3.3E+00 | 4.9E+00 | 6.5E+00 | 8.1E+00 |
| Total | 1.4E-01 | 2.1E-01 | 3.8E-01 | 7.2E-01 | 1.1E+00 | 1.8E+00 | 2.6E+00 | 3.5E+00 | 5.1E+00 | 6.8E+00 | 8.5E+00 |
| Mean Total for Nonsmokers | 2.6E-01 | 4.1E-01 | 7.3E-01 | 1.4E+00 | 2.0E+00 | 3.4E+00 | 5.0E+00 | 6.6E+00 | 9.8E+00 | 1.3E+01 | 1.6E+01 |
| **Male Smoker** | | | | | | | | | | | |
| Lung Cancer | 9.4E-02 | 1.5E-01 | 2.6E-01 | 5.0E-01 | 7.4E-01 | 1.2E+00 | 1.8E+00 | 2.4E+00 | 3.5E+00 | 4.7E+00 | 5.9E+00 |
| Mesotheliomas | 7.6E-02 | 1.2E-01 | 2.2E-01 | 4.2E-01 | 6.0E-01 | 9.8E-01 | 1.5E+00 | 1.9E+00 | 2.9E+00 | 3.8E+00 | 4.8E+00 |
| Total | 1.7E-01 | 2.8E-01 | 4.8E-01 | 9.2E-01 | 1.3E+00 | 2.2E+00 | 3.2E+00 | 4.3E+00 | 6.4E+00 | 8.5E+00 | 1.1E+01 |
| **Female Smoker** | | | | | | | | | | | |
| Lung Cancer | 6.4E-02 | 1.0E-01 | 1.8E-01 | 3.4E-01 | 5.0E-01 | 8.2E-01 | 1.2E+00 | 1.6E+00 | 2.4E+00 | 3.2E+00 | 4.0E+00 |
| Mesotheliomas | 1.1E-01 | 1.9E-01 | 3.2E-01 | 6.2E-01 | 9.0E-01 | 1.5E+00 | 2.2E+00 | 2.9E+00 | 4.3E+00 | 5.8E+00 | 7.2E+00 |
| Total | 1.8E-01 | 2.9E-01 | 5.0E-01 | 9.6E-01 | 1.4E+00 | 2.3E+00 | 3.4E+00 | 4.5E+00 | 6.7E+00 | 9.0E+00 | 1.1E+01 |
| Mean Total for Smokers | 1.7E-01 | 2.8E-01 | 4.9E-01 | 9.4E-01 | 1.4E+00 | 2.2E+00 | 3.3E+00 | 4.4E+00 | 6.6E+00 | 8.8E+00 | 1.1E+01 |

Source: Berman and Crump (1999)

## Table 2: Summary of Available PCM-Based Exposure Levels for Asbestos

| Agency | Description | Nominal Value | Reference |
|---|---|---|---|
| ACGIH | TLV-TWA | 0.1 f/cc | ACGIH, 1998 |
| NIOSH | REL 100 minute TWA in a 400L sample (all forms) | 0.1 f/cc | NIOSH 1999 |
| OSHA | PEL (TWA) all forms | 0.1 f/cc | OSHA 1998<br>29 CFR 1919.1001 |
| OSHA | PEL (ceiling) 30 minute average - all forms | 1.0 f/cc | OSHA 1998<br>29 CFR 1926.1101 |
| EPA (IRIS) | Inhalation unit risk - all forms | 0.23 per (f/mL) | IRIS 1999 |
| EPA (OW) | MCL (f>10 um in length) all forms | 7 MFL[a] | EPA 1998 |

[a] MFL = million fibers per liter

Appendix B

Drawings

| Sheet No. | Description |
| --- | --- |
| C-14A | Site Restoration Plan - North |
| C-15A | Site Restoration Plan - South |

EPA REGION VIII
SUPERFUND DOCUMENT MANAGEMENT SYSTEM

DOC ID # 486962

IMAGERY COVER SHEET
UNSCANNABLE ITEM(S)

Contact the Superfund Records Center to view this (these) document(s).
*(303-312-6473)*

**SITE NAME**: LIBBY

**REPORT OR DOCUMENT TITLE**: SCREENING FACILITY, FINAL REMOVAL ACTION WORK PLAN. LIBBY MONTANA ASBESTOS EMERGENCY RESPONSE PROJECT

**DATE OF DOCUMENT**: 06/18/01

**DESCRIPTION**: OVERSIZED MAPS (2)

# Appendix C

## State of Montana Requirements for Private Subsurface Sewage Disposal Systems

CIRCULAR WQB 5

MONTANA DEPARTMENT

OF

HEALTH AND ENVIRONMENTAL SCIENCES

MINIMUM DESIGN STANDARDS

FOR

ON-SITE ALTERNATIVE

SEWAGE TREATMENT AND DISPOSAL SYSTEMS

1992 Edition

# FORWARD

This Circular adopts Circular WQB-4 "Standards for Multi-family Sewage Systems and Public Subsurface Sewage Treatment Systems," forward and appendices included. The Designer is encouraged to familiarize him or herself with Circulars WQB-4 and WQB-6; specifically the site requirements for "conventional on-site sewage treatment systems. The alternative treatment systems presented in this chapter will allow the designer more sewage disposal options when site conditions are such that conventional systems are not feasible. Since Circular WQB-4 covers up and through chapter 60, this Circular commences with chapter 70.

# CHAPTER 70

## STANDARD ALTERNATIVE SYSTEMS

This category of alternative individual on-site treatment systems will function satisfactorily when properly designed and installed. They are placed in this category due to extensive knowledge and past experience obtained through the installation of these systems and their basic design.

70 General Criteria

70.1 Types

a. Shallow capped drainfields

b. Waste segregation systems

c. Sand lined drainfields

d. Cut systems

70.2 Waiver - A waiver from the use of a conventional subsurface sewage disposal treatment system must be obtained from the review authority (County or State) prior to the installation of a standard alternate system (SAS).

70.3 Design - A standard alternative system may be designed and submitted by the applicant. A detailed design will be required. Design criteria shall conform to the minimum design criteria set forth in this circular

70.4 Limitations - A limitation to the number of (SAS) systems in a specific geographical location may be enforced depending on the type of system proposed and the environmental sensitivity of the area of installation.

71 Shallow Capped Drainfields

71.1 General - A shallow capped drainfield is very similar to the conventional drainfield described in Circulars WQB-4 & 6. The main purposes of shallow capped drainfields are to maintain a 4 foot separation between bedrock or shallow water table and/or to increase the separation distance to add to subsurface treatment in porous soils.

71.2 Limitation - Shallow capped drainfields will be limited in area depending on the soils, permeability and population density. If existing wells in the area have had past contamination due to effluent from subsurface sewage disposal systems, this system will not be considered. Under no circumstances shall a shallow capped drainfield be considered when the water table or bedrock reaches within 5 feet of the natural ground surface. This Department will require groundwater monitoring through one season of the seasonal high groundwater period to determine the groundwater peak. The drainrock shall not extend above the natural soil surface.

71.3 Location - All siting requirements from Title 16, Chapter 16, sub-Chapter 3 for conventional subsurface sewage system shall apply to this type of system except that the depth from the natural ground surface to seasonal high groundwater, creviced bedrock or limiting strata may be 5 feet. Shallow capped drain fields shall not be used where percolation tests are less than 3 min/inch unless it is used in conjunction with an experimental alternative system of chapter 80 and conditions approved by the reviewing authority are met.

71.4 Design - Design shall meet the requirements of Title 16, Chapter 16, subchapter 3 other than the depth of the drainfield.

71.5 Materials - Materials shall meet the minimum requirements in Circulars WQB-4 & 6.

71.6 Construction

71.601 Trench depth shall not be less than 12 inches below the natural ground surface.

72.602 A minimum of 12 inches of fill material shall be placed as a cap above the natural ground surface and tapered from the edge of the trench wall with a 3 horizontal to 1 vertical or lesser slope.

72 Waste Segregation

72.1 General - Waste segregation systems consist of dry disposal for human waste such as various chemical and incinerator type systems with separate disposal for grey water. However, regardless of the type of dry disposal system used, the grey water must be disposed of by primary (septic tank) and secondary (subsurface drainfield) treatment.

72.2 Limitation - Waste segregation systems will only be considered for recreational type dwellings which receive seasonal use or commercial buildings. This system will only be considered where it is demonstrated that the parcel has an acceptable drainfield and 100 percent replacement site for future development needs.

72.3 Location - A complete layout showing the location of the future drainfield and 100 percent replacement site should be provided. Site information must meet the same requirements for a conventional subsurface sewage disposal system.

72.4 Design - Technical factory literature of the type of system proposed will be required.

72.5 Maintenance - A written plan of maintenance and final disposal of humus must be provided.

73 Sand Lined Drainfields

73.1 General - Sand lined drainfields will be considered when soils are determined to be a poor filter medium or when percolation tests show results of rates faster than 3 minutes per inch. The Department may require sand lined drainfields when a danger of groundwater pollution exists.

73.2 Location - Site requirements shall meet the minimum standards for conventional systems as stated in Title 16, Chapter 16, subchapter 3.

73.3 Design - Trenches shall be excavated to a depth to provide a minimum of 12 inches of washed fine to medium sand (ASTM C-33 concrete sand with less than 4% passing the 100 sieve). All other design requirements must meet Circulars WQB-4 & 6.

73.4 Construction - When soils are determined to be extremely porous and lacking fines throughout the profile below the trench to the water table, the Department may require that the side walls of the trench be lined with a minimum of 12 inches of washed fine to medium sand. In such cases, trenches must be a minimum of 36 inches wide. Detailed construction techniques will be required showing how side walls will be lined. Sand shall not be allowed to enter into the washed gravel zone during construction. The system is to be sized according to the receiving soils at the sand and soil interface or at 1.2 gals.\sq.ft., which ever is less.

74 Cut Systems

74.1 General - Cut systems are defined as subsurface disposal systems installed in natural soils where the upper soil layers have been removed to modify the slope requirements of the site.

74.2 Limitation - Cut systems will only be considered on slopes that do not exceed 25 percent and where the downhill slope below the cut area is not greater than 25 percent. Soils shall be absent of any restrictive layers to a depth of 10 feet.

74.3 Location - Site requirements shall meet the minimum standards for conventional systems as stated in Title 16, Chapter 16, subchapter 3.

74.4 Design

74.401 Cut areas shall be physically completed for both the drainfield and 100 percent replacement site prior to approval. A 7 to 10 foot deep test hole shall be excavated on the cut area and a detailed soils profile shall be provided. The percolation test shall also be performed after the cut has been completed.

74.402 A complete lot layout shall be submitted showing the cut areas, the uphill and downhill slope and slope across the cut area. Slope across the drainfield site shall be a uniform slope less than 5 percent.

74.5 Construction - A letter of verification from the County Health Department indicating that the site meets minimum requirements after the cut has been completed will be required.

# CHAPTER 80

## EXPERIMENTAL ALTERNATIVE SYSTEMS

This category of alternative individual on-site treatment systems includes those systems which have been used successfully in various applications. They are placed in this category either due to their complexity of design or due to limited knowledge with their effectiveness in the State of Montana.

80 General Criteria

80.1 Types

a. Elevated sand mound (Wisconsin Mound)

b. Evapo-transpiration system

c. Aerobic package plant system

d. Artificially drained site

e. Intermittent sand filter system

f. Recirculating sand filter system

g. Nutrient removal system

h. Fill system

80.2 Waiver - A waiver from the use of a conventional subsurface sewage disposal treatment system must be obtained from the review authority (County or State) prior to the installation of an experimental alternative system (EAS).

80.3 Design - All systems in this category must be designed by an individual with expertise in the design of said system and may include engineers, sanitarians, soil scientists or other persons whose qualifications are demonstrated to the Department to be sufficient. All designers will be requested to submit a resume of their education and experience directly related to the design of alternative sewage systems. Publications such as the EPA Design Manual On-Site Wastewater Treatment and Disposal Systems (October 1980), Recommended Standards for Individual Sewage Systems (1980 Edition), University of Wisconsin design and construction manuals, Design of Pressure Distribution Networks for Septic Tank - Soil Absorption Systems (January 1981) and the Design and Construction Manual for Wisconsin Mounds

(September 1978) as published by the "Small Scale Waste Management Project" shall be used as design guidelines. Criteria within these manuals that conflicts with this circular or Title 16, Chapter 16, subchapter 3 shall not be used for design purposes. Upon completion of the project, the designer must submit written certification to the Department that construction was in accordance with approved plans and specifications. The Montana Board of Health and Environmental Sciences acknowledges the efforts put forth in the past decade by neighboring states to the west regarding onsite wastewater treatment systems. Special thanks to the State of Idaho Department of Health and Welfare, Oregon Department of Environmental Quality, and Washington State Department of Health as much of their work is incorporated into this revised Circular.

80.4 Location - All EASs shall be sited according to specific criteria contained in Title 16, Chapter 16, subchapter 3 as modified by this circular.

80.5 Monitoring - Post construction inspections by the person who designed the system will be required of all systems in this category. In general, semiannual onsite inspections documenting usage, maintenance, system operation and malfunction or failure will be required of the designer. Groundwater analysis and/or other special monitoring requirements may be stipulated for some types of systems. Monitoring shall be conducted for a minimum of 3 years following completion of the system unless the system is not in continuous use whereby this period may be extended. In all cases, the property owner shall be responsible for all monitoring costs incurred. A guaranteed commitment to monitoring must be established prior to approval of system design. An escrow fund earmarked for monitoring purposes may be required to ensure that the alternative system continues to function properly. The designer shall supply a cost breakdown for the monitoring and testing requirements set forth by the reviewing authority with the submittal. If an escrow fund is required, evidence indicating the establishment of such a fund shall be submitted.

## 81 Elevated Sand Mound

81.1 General - Elevated sand mounds may be considered whenever site conditions set forth in Title 16, Chapter 16, subchapter 3 preclude the use of conventional subsurface absorption systems. The construction of a mound shall be initiated only after a site evaluation has been made and landscaping, dwelling placement, effect on surface drainage and general topography have been considered. Due to the nature of this alternative system, actual selection of mound location, size of mound and construction techniques must be carefully considered and the criteria established in this circular implicitly followed.

81.2 <u>Location</u>

81.201 Elevated sand mounds shall not be utilized on sites within 100 feet of the 100 year floodplain.

81.202 Elevated sand mounds shall not be utilized on soils where the high groundwater level, bedrock or other strata having a percolation rate slower than 120 minutes per inch occurs within 48 inches of natural grade or where rapid percolation may result in contamination of water-bearing formations or surface waters. Elevated sand mounds shall be constructed only upon undisturbed naturally occurring soils.

81.203 Elevated sand mounds shall be located at least 100 feet from a potable individual well water supply or pump suction line as measured from the outer edge of the mound. Greater horizontal separation distances may be needed depending on the type and location of nearby water supplies.

81.204 Elevated sand mounds shall be located at least 100 feet from a stream, watercourse, lake, impoundment and any swamp or seep as measured from the outer edge of the mounds.

81.205 Elevated sand mounds shall be located a minimum distance of 10 feet as measured from the outer edge of the mound, from property lines, buildings, driveways or any other subsurface obstructions except that this distance shall be 50 feet on the down gradient side of the mounds. There shall be a 25 food setback from escarpments. No future construction activity is to take place in the effluent dispersal area described in this section as long as the mound is in use.

81.3 <u>Fill Material</u> - The fill material to a depth of 24 inches shall be a clean uniform sand with a maximum of 50 percent of the particles by weight equal to or less than 0.1 mm and greater than 0.05 mm (very fine sand).

The remaining sand fragment shall consist of 0.1 mm to 2.0 mm particle size (fine to very coarse sand) with a minimum of 25 percent with a particle size of 0.25 mm to 0.6 mm (medium sand).

81.4 Design

81.401 The EPA Design Manual On-Site Wastewater Treatment and Disposal Systems (October 1980), pages 250 to 255 is recommended as a procedural guideline in the design of elevated sand mounds.

81.402 There shall be a minimum of 1 foot of fill material and 4 feet of naturally occurring soils between the bottom of the gravel or crushed stone and the highest elevation of the limiting conditions as defined in Section 81.202. Absorption trench depth shall be a minimum of 9 inches.

81.403 Gravel or crushed stone shall be washed and shall range in size from 3/4 to 2 1/2 inches.

81.404 Elevated sand mounds shall utilize absorption trench distribution design and shall not be installed on land with a slope greater than 12 percent for permeable soils (1-29 min/inch) nor installed on land with a slope greater than 6 percent on tighter soils (30-120 min/inch). The trenches shall be installed with the long dimension of the trench parallel to the land contour. The minimum spacing between trenches shall be 4 feet and the trench width shall be 3 feet.

81.405 A minimum total trench length of 40 feet shall be provided in each trench in mounds constructed on soils with percolation rates of 50 to 120 minutes per inch when two or more trenches are used.

81.406 The required bottom area of the trench or trenches shall be based upon flows as detemined in Circulars WQB 4 or 6 with an application rate of 1.2 gallons/day/square foot.

81.407 The effective basal area of the mound for soils with a percolation rate of 5 to 44 minutes per inch is to be calculated on an application rate of 0.74 gallons/day/square foot.

81.408 The effective basal area of the mound for soils with a percolation rate of 45 to 59 minutes per inch is to be calculated on an application rate of 0.5 gallons/day/square foot.

81.409 The effective basal area of the mound for soils with a percolation rate of 60 to 120 minutes per inch is to be calculated on an application rate of 0.24 gallons/day/square foot.

81.410 The land area 50 feet down gradient of the elevated sand mound is the effluent dispersal area and soil in this area may not be removed or disturbed except as specified herein.

81.411 The area of sand fill shall be sufficient to extend 3 feet beyond the end of the required absorption area before the sides are shaped to a 4 horizontal to 1 vertical or lesser slope. On sloping sites, the downslope setback shall be based upon soil permeability.

81.412 The soil cap at the ends of the absorption area shall be a minimum of 12 inches and shall be a minimum of 18 inches at the center of the bed. These depths include 4-6 inches of topsoil.

81.5 <u>Construction</u>

81.501 Construction equipment which would cause undesirable compaction of the soils shall not be moved across the plowed surface or the effluent disposal area. However, after placement of a minimum of 6 inches of sand fill over the plowed area, construction equipment may be driven over the protected surface to expedite construction. Construction and/or plowing shall not be initiated when the soil moisture content is high. (Note: If a sample of soil obtained from approximately 9 inches below the surface can be easily rolled into a wire the soil content is too high for construction purposes.)

81.502 Above-ground vegetation must be closely cut and removed from the ground surface throughout the area to be utilized for the placement of the fill material. Prior to plowing, the dosing pump discharge line from the pump chamber to the point of connection with the distribution piping header shall be installed. The area shall then be plowed to a depth of 7 to 8 inches, parallel to the land contour with the plow throwing the soil upslope to provide a proper interface between the fill and natural soils. Tree stumps should be cut flush with the surface of the ground and roots should not be pulled.

81.503 The area surrounding the elevated sand mound shall be graded to provide for diversion of surface runoff waters.

81.504 Construction should be initiated immediately after preparation of the soil interface by placing all of the sand fill needed for the mound (to the top of the trench) to a minimum depth of 21 inches above the plowed surface. This depth will permit excavation of trenches to accommodate the 9 inches of gravel or crushed stone necessary for the distribution piping. After hand leveling of the absorption area, the stone should be placed into the trench and hand leveled. Place the distribution pipe and cover the pipe as specified in Circular WQB-4. After installation of the distribution system, the entire mound should be covered with 6 inches of a finer textured soil material such as clay or silt loam. A 6 inch layer of topsoil should then be added. The entire mound should be crowned by providing a minimum of 12 inches of cover on the side slopes, with a minimum of 18 inches over the center of the mound. The entire mound shall be seeded, sodded or otherwise provided with vegetative cover, to assure stability of the installation.

81.6 Dosing System Design

81.601 Pressure dosing shall be required for the elevated sand mound system.

## 82 Evapo-transpiration System

82.1 General - Evapo-transpiration systems (ET) or evapo-transpiration/absorption (ETA) systems may be considered whenever site conditions set forth in Title 16, Chapter 16, subchapter 3 preclude the use of conventional subsurface absorption systems. The construction of an ET or ETA system shall be initiated only after a site evaluation has been made and landscaping, dwelling placement, effect on surface drainage and general topography have been considered. The most significant constraint on the use of ET or ETA systems is climatic conditions. During periods when evaporation does not exceed precipitation, long-term storage capacity will be necessary.

82.2 Location - The same criteria as outlined in Section 81.2 applies to the siting of ET and ETA systems with the exception of soil permeability. Those soils with very slow permeability may be considered for ETA systems. Soils with rapid permeability will not exclude the use of an ET system.

82.3 Fill Material - The fill material to a depth of 24 inches shall be a clean uniform sand with a maximum of 50 percent of the particles by weight equal to or less than 0.1 mm and greater than 0.05 mm (very fine sand). The remaining sand fragment shall consist of 0.1 mm to 2.0 mm particle size (fine to very coarse sand) with a minimum of 25 percent with a particle size of 0.25 mm to 0.6 mm (medium sand).

82.4 Design

82.401 A synthetic plastic liner of at least 10 mils thickness will be required for ET systems where the seasonal high groundwater is within 6 feet of the natural ground surface or where rapidly permeable soils are present.

82.402 There shall be a minimum of 2 feet of naturally occurring soils between the bottom of the liner and the high groundwater level or creviced bedrock.

82.403 There shall be a minimum of 2 feet of sand fill between the natural ground surface and the liner.

82.404 Washed gravel or clean crushed stone placed around the distribution pipes shall be 3/4 to 2 1/2 inch in size.

82.405 ET and ETA systems shall utilize absorption trench distribution trench design and shall not be install on land with a slope greater than 12 percent. The trenches shall be installed with the long dimension of the trench parallel to the land contour. The minimum spacing between trenches shall be 4 feet, a maximum trench width of 2 feet shall be permitted.

82.406 The area of the ET system will be based upon the pan evaporation minus precipitation for the wettest year in a 10 year period. The area of an ETA system will be based upon the same data with the addition of actual percolation data from the site. Typically storage capacity must be built into the system to accommodate months with low evaporation.

82.407 A minimum cap of topsoil of 6 inches shall be provided over the entire bed area.

82.5 <u>Construction</u>

82.501 For ETA systems the following precautions are necessary:

a. Excavation may provide in clayey soils only when the moisture content is below the soil's plastic limit. If a sample of soil taken at the depth of the proposed bottom of the system forms a "wire" instead of crumbling when attempting to roll it between the hands, the soil is too wet.

b. A backhoe is usually used to excavate the system. Front-end loaders or bulldozer blades should not be used because the scraping action of the bucket or blade can smear the soil severely and the wheel or tracks compact the exposed infiltrative surface.

c. Excavation equipment must not be driven on the bottom of the system. If trenches are used, the equipment can straddle the excavation. If a bed is used, the bed should be divided into segments so the machinery can always operate from undisturbed soil.

d. The bottom of each trench or bed must be level throughout to ensure more uniform distribution of effluent. A level and tripod are essential equipment.

e. The bottom and sidewalls of the excavation should be left with a rough open surface. Any smeared and compacted surfaces should be removed with care.

f. Work should be scheduled only when the infiltrative surface can be covered in one day, because wind-blown silt or raindrop impact can clog the soil.

g. Once the infiltrative surface is properly prepared, the backfilling operations must be done carefully to avoid any damage to the soil.

h. The gravel or crushed rock used as a porous media is <u>laid</u> in by a backhoe or front-end loader rather than dumped in by a truck. This should be done from the sides of the system rather than driving out onto the exposed bottom. In large beds, the gravel or rock should be pushed out ahead of a small bulldozer.

i. The distribution pipes are covered with a minimum of 2 inches of gravel or rock to retard root growth, to insulate against freezing and to stabilize the pipe before backfilling.

j. The gravel or rock is covered with synthetic drainage fabric to prevent the unconsolidated soil cover from entering the media. The media should be covered completely.

k. The backfill material should be relatively porous, such as loamy sand or sandy loam. It should be mounded above natural grade to allow for settling and to channel runoff away from the system.

82.502 Synthetic liners for ET systems must be cushioned on both sides with layers of sand at least 2 inches thick to prevent puncturing during construction. It may be preferable to use a double thickness of liner material so that the seams can be staggered if seams are unavoidable.

82.503 Construction should be initiated immediately after preparation of the soil interface or liner by placing all of the fill needed to a minimum depth of 24 inches. Next, trenches should be excavated to a depth of 12 inches for the placement of gravel and the distribution pipe. Trench sidewalls should be protected by placing synthetic filter fabric as a liner. The pipe should be covered as specified in 82.501 above. The entire site should be crowned with a minimum of 6 inches and a maximum of 12 inches of topsoil. The bed surface should be sloped for positive drainage.

82.6 Dosing System Design

82.601 Pressure dosing shall be required for the ET or ETA system.

82.602 The dosing system shall be designed in accordance with Section 60.7.

83 Aerobic Package Plant Systems

83.1 General - Aerobic package plant systems may be used in lieu of a conventional septic tank whenever desirable due to marginal site conditions such as minimum depth to water table or very porous soil conditions. A means of securing continuous maintenance and operation of the system must be outlined. Aerobic treatment plants should be pumped at least once a year to remove excess solids from the plant.

83.2 Location - The same site criteria that applies to conventional subsurface sewage absorption systems will apply to this category. Separation to seasonal high groundwater or creviced bedrock will be no less than 4 feet as measured to the bottom of the trench. Soils must meet the standard percolation test as outlined in Circular WQB-6.

83.3 Design

83.301 The size of the absorption drainfield will be identical to that determined for a conventional subsurface sewage absorption system.

83.302 All aerobic treatment systems shall be NSF Class 1, Standard 40 approved.

84 Artificially Drained Site

84.1 General - Artificially drained systems may be considered whenever site conditions set forth in Title 16, Chapter 16, subchapter 3 preclude the use of conventional subsurface absorption systems. The construction of this type of system shall be initiated only after a site evaluation has been made and landscaping, dwelling placement, effect on surface drainage and general topography have been considered. It must be shown that the groundwater within the proposed subsurface absorption system site has been lowered to acceptable levels before final approval will be issued. Emphasis will be placed upon topographic surveys, soil profile descriptions and seasonal high groundwater elevations and gradients. Large free moving bodies of water and artesian aquifers may not be suitable for this type of system.

84.2 Location - The same site criteria that applies to conventional subsurface sewage absorption systems will apply to this category. However, those with naturally occurring seasonal high groundwater will be accepted provided the drainage system reduces groundwater levels to the accepted standard of 6 feet from the ground surface.

84.3 Design

84.301 The EPA Design Manual On-Site Wastewater Treatment and Disposal Systems (October 1980), pages 260 to 268 is recommended as a guideline in design of drained systems.

84.302 A topographic map of the proposed drainfield and replacement site showing 1 or 2 foot intervals must be provided. Water table elevations, seep areas and areas with vegetation indicative of seasonal or prolonged high water tables must be located on the map. Elevations of ridges, knolls, rock outcrops and natural drainage ways should also be shown.

84.303 Precise soil descriptions of the soil profile to a depth of 10 feet will be necessary. Soil stratification of layering and soil color must be noted along with texture, density, saturated zones and root penetration. The thickness and slope of each layer must be described. Soil mottling must be noted.

84.304 Groundwater elevation and gradient must be established through the observation of monitoring wells throughout the seasonal high groundwater period. Typically, several wells would be desirable but at least 2 wells will be required, one placed up gradient of the drainfield site, the other down gradient from the site. Monitoring wells must be properly constructed so that accurate results are obtained. Levels shall be checked weekly during the peak groundwater period. A drawing showing contours of the water table surface shall be provided.

84.305 The drainage method chosen (curtain drain, vertical drain or underdrain) and the reason for this choice must be detailed. Drawings showing dimensions of the drain system and materials to be utilized shall be provided.

84.306 A separation distance of 10 feet must be maintained between the drain and the soil absorption system. Silt traps may be necessary to improve the quality of the discharged drainage.

84.4 <u>Construction</u>

84.401 The subsurface sewage absorption system shall be constructed according to conventional system standards or alternative system standards where applicable.

84.402 The drainage system shall be constructed according to the specific design approved by the Department and standards generally recommended by the EPA Design Manual.

84.403 Permanent groundwater monitoring wells will be required for this type of system.

85 <u>Intermittent Sand Filter System</u>

85.1 <u>General</u> - The utilization of sand filters as a method of providing additional treatment of effluent discharged from a septic tank or aerobic treatment unit may be considered whenever site conditions set forth in Title 16, Chapter 16, subchapter 3 preclude the use of conventional subsurface absorption systems. The design criteria shall include, but not necessarily be limited to, the type of usage, primary treatment, filter media, filtration rate and dosage rate. Sand filters must discharge to a subsurface absorption system. The drainfield used for final disposal may be downsized by 50% as determined by Circular WQB-4, Section 60.302.

85.2 <u>Location</u>

85.201 Intermittent sand filters (ISF) shall not be utilized on sites within 100 feet of the 100 year floodplain.

85.202 ISF systems shall not be installed in areas where creviced bedrock, seasonal high groundwater table or strata having percolation rate slower than 120 minutes per inch occurs within 4 feet of the natural ground surface or where rapid percolation may result in contamination of water bearing formations or surface waters.

85.203 ISF systems shall be located at least 100 feet from a potable individual well water supply or pump suction line. Greater horizontal separation distances may be needed depending on engineering and hydrogeological data and type of water supply.

85.204 ISF systems shall be located at least 10 feet from property lines, buildings, driveways or other subsurface obstructions.

85.205 ISF systems shall be located at least 100 feet from a stream, watercourse, lake, impoundment and any swamp or seep as measured from the outer edge of the system.

85.3 Design

85.301 The minimum area in any subsurface sand filter shall be based upon a flow as determined in Circular WQB-4, chapter 30.

85.302 The application rate for intermittent sand filters shall not exceed 1.2 Gal/Day/sq.ft.. The sand filter media shall meet ASTM C-33 specifications and shall not have more than 45% passing any one sieve and retained on the next consecutive sieve.

85.303 Collection lines and the bottom of the excavation shall have a slope of 1 percent and 1 collection line shall be provided for each 6 feet of width or fraction thereof. A minimum of 2 collection lines shall be provided. The upper end of the collection line shall be sealed or plugged.

85.304 Distribution lines shall be level and shall be horizontally spaced a maximum of 3 feet apart, center to center.

85.305 The minimum depth of filter media shall be 24 inches. The filter media shall be separated from the gravel or crushed stone by 3 inches of 1/4 inch pea gravel.

85.306 A 30 mil PVC liner shall be used to line the sand filter. A reinforced concrete container shall be required where the filter must be protected from groundwater infiltration.

85.4 Construction

85.401 Gravel or crushed stone shall be placed at a minimum depth of 10 inches around distribution and collection lines.

85.402 The filter shall be covered with 12 to 18 inches of soil.

85.404 Monitoring pipes to detect filter clogging will be required.

85.5 Materials

85.501 The filter media shall have a uniformity coefficient of less than 3.5. The filter media shall be washed and free of clay or silt.

85.502 Gravel or crushed stone shall be washed and shall range in size from 3/4 to 1 1/2 inches for the distribution lines and shall range in size from 1/4 to 1 1/2 inches for the under-drain lines.

85.503 Pea gravel shall be washed and range in size from 1/8 to 3/8 inch.

85.504 The material used to cover the top of the gravel or stone shall be synthetic drainage fabric, two or more layers of untreated building paper or a 4-6 inch layer of straw.

85.505 Pipe used for distribution and collection lines shall meet the appropriate ASTM standard or those of an equivalent testing laboratory. Fittings used shall be compatible with the materials used in the distribution and/or collection lines.

85.506 Materials selected shall be constructed of cement or rigid plastic pipe. If perforated distribution and/or collection lines are used, the perforation shall be at least 1/8 inch and no more than 3/4 inch in diameter and spaced to provide at least the equivalent total opening of comparable diameter foot-long tile laid with 1/4 inch open joints.

85.6 Dosing System Design

85.601 Pressure dosing shall be required for all sand filters.

85.602 Dosing systems shall be designed in accordance with Section 60.7.

## 86 Recirculating Sand Filters

86.1 When a recirculating sand filter is used, effluent from the septic tank or other primary treatment device must discharge directly to the recirculation tank. The minimum criteria relative to the location, design considerations, materials, dosing and general construction details provided for intermittent sand filters shall also apply to recirculating sand filters except as follows:

86.101 The design of a recirculating sand filter is similar to the design of a intermittent sand filter except that it must be located to permit gravity flow into the top of the recirculation tank from the collection line of the filter.

86.102 The depth of filter media shall be at least 30 inches.

86.103 The maximum application rate shall be 3 gallons/day/ft2 of filter area.

86.104 The liquid capacity of the recirculation tank shall be equal to 750 gallons or 1 1/2 times the daily design sewage flow.

86.105 The filter effluent line, passing through the recirculation tank, shall be provided with a control device that directs the flow of the filter effluent. The filter effluent will be returned to the recirculation tank for recycling or be discharged to the subsurface absorption system depending upon the liquid level in the recirculation tank.

86.106 The recirculating pump shall be of adequate size to recirculate the daily design sewage flow at least 4 times through the sand filter. The recirculating pump shall be sized to dose the filter every 1/2 hour within a 10 minute period. The dose volume is, therefore, 4 times the daily flow divided by 48. Dosing frequency may be reduced as dictated by climatic conditions to minimize the possibility of freezing of the filter surface.

86.107 The effluent shall be discharged in such a manner as to provide uniform distribution through a system of pipes or troughs supported above the filter surface.

86.108 The filter surface which is sand rather than gravel must be raked and leveled on a routine basis. The filter shall be kept free of weed growth and the accumulation of all debris. Where climatic conditions dictate the installation of a cover, it shall be constructed to minimize freezing, support anticipated snow loads and permit air circulation. After extended periods of operation, a crust may develop on the surface of the sand in some areas. When ponding occurs, the upper 1/2 to 1 inch of crust and sand should be removed and discarded. The sand surface may then be raked and leveled and the process continued until a minimum of 24 inches of sand remains. At that time, the filter shall be reconstructed by adding new, coarse sand and the operation of the filter reinstituted.

86.109 A small hole shall be provided on the pump discharge line inside the recirculation tank to allow the discharge line to drain back into the recirculation tank.

## 87 Nutrient Removal System

87.1 General - Nutrient removal systems may be used when use of a conventional subsurface sewage absorption system is likely to degrade water quality. In general, subsurface sewage treatment systems located in close proximity to lakes may require additional nutrient removal especially where very permeable soils are present. A means of securing continuous maintenance and operation of the system must be outlined.

87.2 Location - The same site criteria that apply to conventional subsurface sewage absorption systems will apply to this category. Thus no reduction from the 6 foot separation to seasonal high groundwater or creviced bedrock will be accepted. Soils must meet standard percolation tests as outlined in Circular WQB 6.

87.3 Design

87.301 Specific design criteria will not be outlined in this document due to the various alternatives and design complexity involved. The EPA Manual On-Site Wastewater Treatment and Disposal Systems (October 1980), pages 184 to 198 will be used as a guideline for the design of these systems. Established research documents may also be utilized as a basis for design.

87.302 Monitoring of these systems will be required in order to establish their efficiency.

## 88 Fill System

88.1 General - Fill systems may be considered whenever site conditions set forth in Title 16, Chapter 16, subchapter 3 preclude the use of conventional subsurface absorption systems. The construction of a fill system shall be initiated only after a site evaluation has been made and landscaping, dwelling placement, effect on surface drainage and general topography have been considered.

88.2 Location

88.201 The same criteria as outlined in Section 81.2 applies to the siting of fill systems.

88.202 Any parcel that will undergo land modification by filling, must have enough area suitable for sewage absorption system placement. The entire area necessary for the initial sewage absorption system plus area for 100 percent replacement must be filled prior to final approval of a parcel.

88.203 Fill systems shall not be installed on land with a slope greater than 12 percent. Sites with less permeable soils (30-60 min/inch) may not be suitable for fill systems unless the slope across the site is less than 6 percent.

88.3 Fill Material

88.301 Fill material shall be of similar porosity and texture as the underlying natural soil. Clay content shall not exceed 10 percent by weight. Fill material with significant amounts of cobbles and boulders (up to 15 percent) is acceptable.

88.302 Prior to the placement of fill material, the texture of both the native soil and the proposed fill must be established. This shall be done by particle size distribution analysis (sieve test) of representative soil samples.

## 88.4 Design

88.401 System configuration, dimensions and orientation must be approved prior to the placement of fill material.

88.402 Fill must be of suitable depth to provide 6 feet of soil from the finished ground surface to seasonal high groundwater, creviced bedrock or a limiting soil layer.

88.403 After the specified settling period, at least 1 ten-foot test hole shall be excavated within the proposed sewage absorption system site. This test hole shall be inspected to determine if remnants of surface vegetation are present or if suitable soil structure is not attained.

88.404 One percolation test shall be performed as a basis for design application rate.

## 88.5 Construction

88.501 All vegetative cover must be removed from the area to be filled.

88.502 Fill material must not be put in place when it is frozen.

88.503 Fill material must be allowed to set undisturbed for a 24 month period prior to the installation of a sewage absorption system. If the fill material is placed in lifts as specified by the engineer (engineered lifts) so as to obtain natural soil structure conditions, the 24 month resting period may be waived by the reviewing authority.

88.504 Sewage absorption trenches shall be set back at least 24 feet from the upper edge of the filled area.

88.505 The fill area shall be seeded to a suitable grass to aid in stabilization.

CIRCULAR WQB 6

MONTANA DEPARTMENT

OF

HEALTH AND ENVIRONMENTAL SCIENCES

STANDARDS

FOR

INDIVIDUAL SEWAGE SYSTEMS

1992 Edition

## FOREWORD

The Board of Health and Environmental Sciences of the State of Montana hereby adopts the following standards to implement the requirements of 16.16.304 ARM.

These standards, based on proven technology, set forth requirements for the design and preparation of plans and specifications for individual subsurface sewage systems.

The terms **shall** and must are used where practice is sufficiently standardized to permit specific delineation of requirements or where safeguarding of the public health justifies such definite action. These mandatory items serve as a check list for the reviewing authority. Other terms, such as **should**, recommended, and preferred, indicate desirable procedures or methods. These non-mandatory items serve as guidelines for designers.

The term "reviewing authority" as used in these standards refers to the Montana Department of Health and Environmental Sciences or a delegated division of local government.

Users of these standards need to be aware that subsurface sewage treatment systems are considered to be EPA Class V injection wells and may require associated permits. Of particular concern are systems receiving wastewater from industries and automotive service stations.

These standards supersede the department's Bulletin 332, March 1984 Edition. These standards are based on the Recommended Standards for Individual Sewage Systems, 1980 Edition, prepared by the Great Lakes Upper Mississippi River Board of Sanitary Engineers. The Board of Health and Environmental Sciences acknowledges this basis and expresses its appreciation to the Great Lakes Upper Mississippi River Board of State Sanitary Engineers for its contribution to public health.

## CHAPTER 10

## SUBMITTAL REQUIREMENTS

Information on the proposed system needs to provided in a report, or equivalent, and plans.

### 10.1 Report

10.101 The following information shall be provided in the report:

a. The number of bedrooms in the dwelling to be served by the system,

b. Depth to seasonal high groundwater and how this information was obtained (see Sections 40.3 and 40.5),

c. Percolation test results in the immediate vicinity of proposed drainfield(s) (see Section 40.6),

d. Soil description, and how it was determined (see Sections 40.3 and 40.5),

e. Depth to bedrock (see Sections 40.3 and 40.5),

f. Name of person(s) who prepared soil descriptions, performed percolation tests and applicable experience of that person,

g. USDA Soil Conservation Service soil survey for site, if available (see Section 40.4).

### 10.2 Plans and Specifications

10.201 The following information shall be provided on the plans:

a. Location, size, slope, and depth of building sewer (see Chapter 20),

b. Location of cleanouts (see Chapter 20),

c. Location of septic tank, drainfield and 100% replacement area (see Chapters 50 and 60),

d. Location of proposed and existing wells and water lines in the area of the proposed system and land adjacent to it, (see Sections 50.102 and 60.2),

e. Lot boundaries, (see Sections 50.102 and 60.2),

f. Location of watercourses, irrigation ditches, lakes and impoundments including the 100 year floodplain in the immediate area, (see Sections 50.102 and 60.202),

g. Percent slope of ground surface and direction of slope (see Section 40.701),

h. Location of soil profile holes and percolation test holes, (see Section 40.5 and 40.6),

i. North point and scale in feet.

# CHAPTER 20

## DESIGN OF SEWERS

### 20.1 Definitions

20.101 House or Building Drain

The pipe extending from the interior plumbing to a point two feet outside the foundation wall.

20.102 House or Building Sewer

The pipe connecting the house or building drain to the septic tank.

### 20.2 Separation of Water and Sewer Lines

20.201 Sewers shall be laid at least 10 feet horizontally from any existing or proposed water line. The distance shall be measured edge to edge.

20.202 Sewers crossing water lines shall be laid to provide a minimum vertical distance of 18 inches between the outside of the water line and the outside of the sewer. This shall be the case where the water line is either above or below the sewer. The crossing shall be arranged so that the sewer joints will be equidistant and as far as possible from the water main joints.

### 20.3 Size and Slope Building Sewers

20.301 Only sanitary sewage shall be placed into the sanitary sewer system. Rain water from roofs, streets, and other areas, and groundwater from foundation drains shall be excluded.

20.302 The minimum size of a building sewer shall be four inches and shall be placed at a minimum slope of 1/4 inch per foot toward the point of discharge. Where it is impractical, due to arrangement of buildings or structures to obtain such a slope, any such piping which is four inches in diameter may have a slope of not less than 1/8 inch per foot when approved by the reviewing authority.

20.4 <u>Sewer Materials</u>

20.401 Sewers shall be made of PVC.

20.402 PVC sewer pipe shall meet the requirements of ASTM D 3034, ASTM D 2729, or ASTM D 1785 (schedule 40) and be joined by bell and spigot joints with elastomeric gaskets or by solvent cement joints.

20.403 Transition connections to other materials shall be made by adapter fittings or one piece molded rubber couplings with appropriate bushings for the respective materials.

20.5 <u>Sewer Installation</u>

20.501 Sewers shall be laid with uniform slope between cleanouts.

20.502 Sewers shall be laid with straight alignment between cleanouts.

20.503 Pipe installation including bedding and backfill shall be in accordance with pipe manufacturer's recommendations.

# CHAPTER 40

## SITE EVALUATION

Information concerning soil and site conditions is needed for the design of liquid waste treatment and disposal facilities. Those factors which must be evaluated are depth of permeable soil over seasonal high groundwater, bedrock, or other limiting layer, soil factors, land slope, flooding hazard, and amount of suitable area available.

### 40.1 Soil Factors

Soil texture and structure, stabilized percolation rate, groundwater and bedrock conditions must be evaluated.

### 40.2 Definitions

#### 40.201 Bedrock

Any rock which cannot be readily excavated by power equipment, or is essentially impermeable, or has open fractures or solution channels.

#### 40.202 Seasonal High Groundwater Level

The vertical distance from the natural ground surface to the groundwater surface as observed as a free water surface in an unlined hole during the time of the year when the groundwater is the highest, or has been saturated as may be indicated by mottling (soil color patterns).

#### 40.203 Limiting Layer

Any layer of soil with a stabilized percolation rate slower than 60 minutes per inch.

### 40.3 Evaluation of Soil Factors

Soil factors shall be evaluated by soil profile observations representative of site and be supported by percolation tests.

### 40.4 Existing Soil Information

Soil surveys are usually found at the local USDA Soil Conservation (SCS) office. While the soil surveys offer good preliminary information about an area, they are not complete nor can they substitute for a field study. However, they are good for determining potential problems which may exist. If available, the appropriate section of the SCS survey should be provided.

40.5 Soil Profile Observations

Soil pits are recommended for soil observation. The minimum depth of soil profile observations shall be seven feet.

40.501 The following factors must be evaluated to the full depth of the holes and reported:

a. Depth to water, if observed,

b. Depth to estimated seasonal high groundwater level,

c. Depth to and type of bedrock, if observed.

40.502 The following determinations should also be reported:

a. Thickness of layers or horizons,

b. Texture (USDA) of soil layers,

c. Color (preferably described by using the notation of the Munsell color scheme) and color variation (mottling),

d. Stoniness reported on a volume basis (i.e. the percentage of the soil volume occupied by particles greater than 2 mm in diameters),

e. Plasticity,

g. Other prominent features such as structure, roots, etc.

40.6 Percolation Tests

Soil percolation tests should be conducted at the optimal depth based on soil profile textures indicating permeable conditions. At least one percolation test shall be performed per site. They shall be conducted at the depth of proposed construction. Additional percolation tests may be needed to identify the existence of a limiting layer. The percolation tests shall be performed in accordance with procedure contained in Appendix A.

40.7 Site Factors

The land slope, potential for flooding and surface water concentration, amount of suitable area must be evaluated.

40.701 Type and percent of land slope

The type (concave, convex, or plane), percent and direction of land slope must be determined and reported.

40.702 Flooding and surface water

The potential for flooding or accumulation of surface water from storm events shall be evaluated.

40.703 Amount of suitable area

Sufficient suitable area must be available for the initial drainfield (absorption field) while maintaining the minimum horizontal isolation distances required to protect water supply, surface waters, property lines, etc. It is also required that sufficient suitable area be available and reserved for a replacement drainfield.

40.704 Groundwater Quality Impact

An assessment of the impact of the system on groundwater quality may be required. Special treatment may be required to meet the nondegradation requirements of the Montana Water Quality Act, Title 75, Chapter 5, MCA.

# CHAPTER 50

## SEPTIC TANKS

A septic tank consists of one or more chambers which provide sufficient retention time to treat the raw sewage.

50 Septic Tanks

50.1 General

50.101 Influent

All liquid waste and washwater shall discharge into the septic tank. Roof, footing, garage, surface water drainage, and cooling water shall be excluded.

50.102 Location

The septic tank shall be located where it is readily accessible for inspection and maintenance. The following are minimum horizontal separation distances that must be provided between the septic tank and the features indicated:

| | |
|---|---|
| Buildings | 10 feet |
| Water wells and suction lines | 50 feet |
| Property lines | 10 feet |
| Water supply lines under pressure | 10 feet |
| Lakes, streams and ponds | 50 feet |
| Cisterns | 25 feet |
| Roadcuts, cliffs or banks | 10 feet |

50.2 Design

50.201 Septic tank design shall be in accordance with Figure 50.1.

50.202 Minimum required septic tank capacity shall be as stated in Table 50-1.

50.3 Acceptance

After installation each tank shall be free from fractures or cracks passing through the floor or walls.

TABLE 50-1

MINIMUM REQUIRED SEPTIC TANK CAPACITIES

| Number of Bedrooms | Liquid Capacity of Tank in Gallons |
| --- | --- |
| 1 or 2 | 750 |
| 3 or 4 | 1000 |
| 5 | 1250 |
| 6 | 1500 |

50.4 Maintenance

The owner of the system shall be provided with septic tank maintenance recommendations contained in Appendix B.

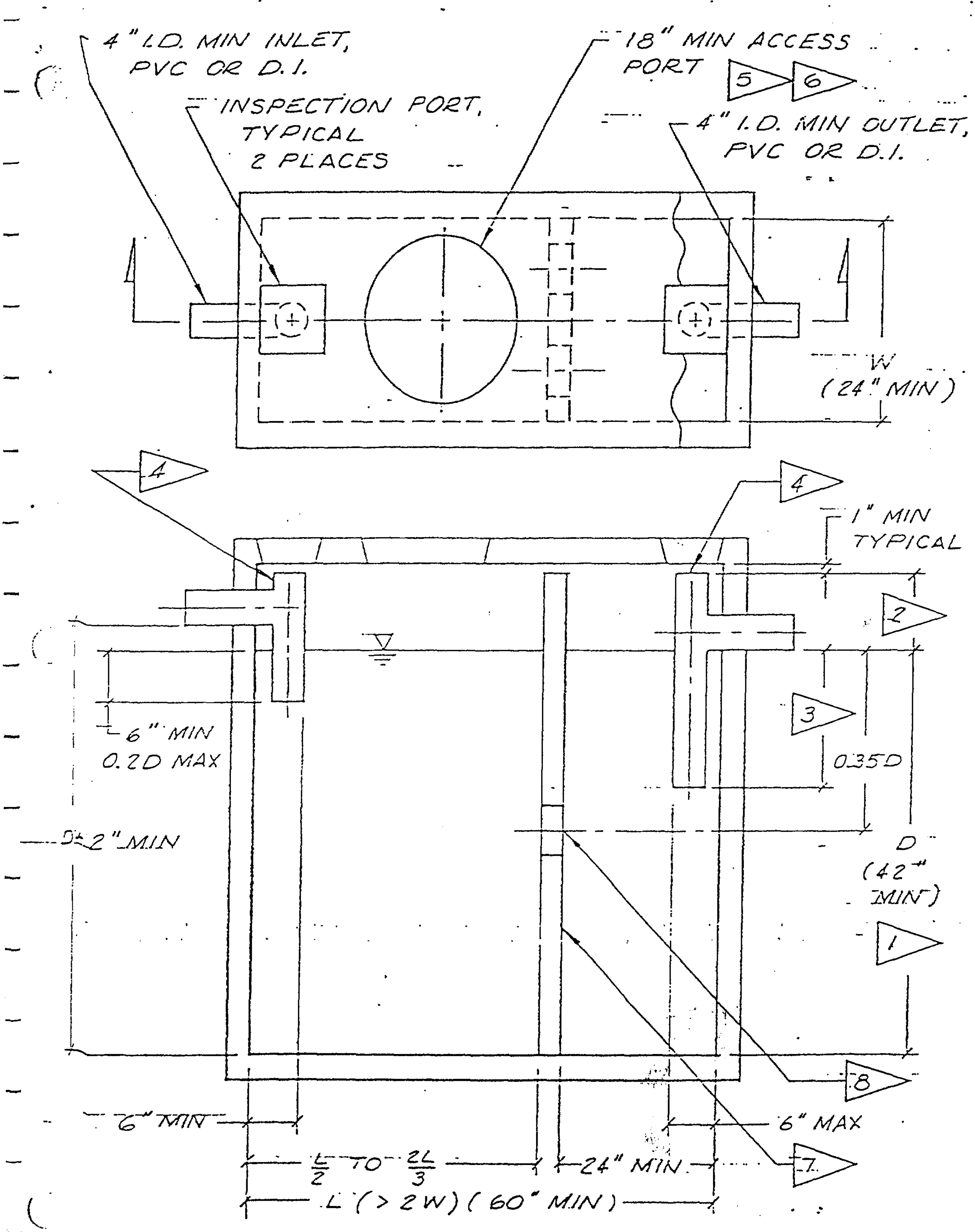


FIGURE 50.1 – SEPTIC TANK REQUIREMENTS

SYMBOLS AND ABBREVIATIONS

| | | | |
|---|---|---|---|
| D | interior depth of tank from bottom to outlet invert | I.D. | inside diameter |
| L | interior length of tank | MIN | minimum |
| W | interior width of tank | MAX | maximum |
| D.I. | ductile iron | PVC | polyvinyl chloride |

NOTES

1. Depth greater than 78 inches shall not be used in computing tank capacity.

2. Rectangular tanks: 0.2 D
Horizontal cylindrical tanks: 0.15 D

3. Rectangular tanks: 0.35 D
Horizontal cylindrical tanks: 0.3 D

4. Tanks may be equipped with baffles that meet the shown dimensional requirements. Horizontal dimensions apply to side of baffle nearest to the tank wall.

5. Access port cover elevation shall be adjusted as necessary with a riser section to within 12 inches of finished grade.

6. Access port is required for each compartment. Cover shall be provided with lifting eye.

7. Compartment wall is optional. When provided, minimum capacity of first compartment shall be 500 gallons.

8. Liquid connection between compartments shall consist of a single opening completely across the compartment wall or two or more openings equally spaced across the wall. Total area of openings shall be at least three times area of inlet pipe.

9. Tank shall be made of reinforced concrete. Concrete used shall be resistant to the corrosive environment found in septic tanks. Other materials may be acceptable when proven suitable to the reviewing authority. The empty tank shall be capable of withstanding loads created by six feet of burial.

10. The installed tank shall be free from fractures or cracks passing through the floor or walls.

11. The tank shall provide an air space having a volume not less the ten percent of its liquid capacity.

FIGURE 50.1 - SEPTIC TANK REQUIREMENTS (continued)

# CHAPTER 60

## CONVENTIONAL SUBSURFACE SEWAGE TREATMENT SYSTEMS

The common design of treatment systems is one using absorption trenches, each separate from the other and each containing a distribution pipe. This type of system should be used whenever practical. Other types of absorption systems may be used as alternatives where the site conditions meet the specific design requirements of such alternative systems.

### 60 Absorption Trenches

#### 60.1 General

The satisfactory operation of the sewage disposal system is largely dependent upon proper site selection, design, and construction of absorption trenches.

#### 60.2 Location

60.201 Absorption trenches shall be located at least 100 feet from a potable water supply or pump suction line. Greater horizontal separation distances may be needed depending on engineering and hydrogeological data and type of water supply.

60.202 Absorption trenches shall be located at least 100 feet from the 100 year flood level of any river, stream, water course, lake or impoundment unless a waiver has been provided by the reviewing authority. A waiver may only be provided if:

a. The water course is an irrigation ditch and the groundwater flow at the drainfield site will not enter the irrigation ditch, or

b. The river or stream average yearly high water mark is a minimum of 100 feet from the drainfield and the bottom of the drainfield will be at least four feet above the 100 year flood elevation.

60.203 Absorption trenches shall be at least ten feet from water lines, property lines and buildings.

60.204 Absorption trenches shall be at least 25 feet from roadcuts, cliffs or banks.

60.205 Absorption trenches shall not be constructed in soils having a percolation rate slower than 60 minutes per inch; or where rapid percolation may result in contamination of water-bearing formations or surface waters.

60.206 Absorption trenches shall not be constructed in soils rated as having severe or very severe limitations for subsurface sewage disposal by the Soil Conservation Service, U.S. Department of Agriculture, unless that limitation is not present as shown by field investigation or can be overcome.

60.207 The absorption trench shall be located to maximize the vertical separation distance from the bottom of the absorption trench to the seasonal high groundwater level, bedrock, or other limiting layer, but under no circumstances shall this vertical separation be less than four feet. Where water-bearing formations are in danger of contamination greater vertical separation may be required.

60.208 Absorption trenches shall not be constructed in unstabilized fill and only in stabilized fill if a waiver has been provided by the reviewing authority. See MDHES Circular WQB 5 for stabilized fill requirements.

60.209 Provisions shall be made to keep vehicular traffic from drainfield area when such activity is likely.

## 60.3 Design

60.301 Minimum absorption field size shall be based on the requirements contained in Table 60-2.

TABLE 60-2

MINIMUM REQUIRED ABSORPTION FIELDS

| Soil Texture | Percolation Rate in Minutes per Inch | Absorption Field Length in Lineal Feet of Two Foot Wide Trench per Bedroom |
|---|---|---|
| Gravel, coarse sand | < 3 | Not suitable for standard absorption system |
| Coarse to medium sand | 3 to 5 | 65 |
| Fine sand, loamy sand | 6 to 7 | 70 |
| | 8 to 10 | 80 |
| | 11 to 15 | 95 |
| Sandy loam, loam | 16 to 20 | 110 |
| | 21 to 25 | 125 |
| | 26 to 30 | 140 |
| Loam, porous silt loam | 31 to 45 | 150 |
| | 46 to 60 | 170 |
| Silty clay loam, clay loam, clay | over 60 | Not suitable for standard absorption system |

60.302 An area that can used as a replacement area for the original absorption trench system shall be designated. Interim use of the area shall be compatible with future absorption system use.

60.303 Gravity fed absorption trenches shall be separated by at least five feet between trench walls.

60.304 Gravity fed absorption trenches shall be at least 18 inches wide and no more than 24 inches wide. See Figure 60.1.

60.306 The bottom of the absorption trenches shall be at least 18 inches and no more than 36 inches below the finished grade.

60.307 Absorption trenches shall not exceed 100 feet in length.

60.308 Gravity fed absorption field distribution lines shall be four inches in diameter.

60.4 Slope

60.401 Gravity fed absorption field distribution lines and trenches shall be level.

60.402 Absorption trenches should not be installed on land with a slope gradient greater than 15%. Absorption trenches may be installed on slopes between 15 and 25% if special conditions approved by the reviewing authority are met.

60.5 Material

60.501 Gravity fed distribution lines shall be fabricated from four inch diameter ASTM D 2729 or ASTM D 3034 PVC sewer pipe with perforations per ASTM D 2729.

60.502 Coiled perforated plastic pipe shall not be used for distribution lines. Straight lengths of pipe shall be used instead.

60.503 Gravel or crushed stone shall be washed and shall range in size from three-fourths to two and one-half inches. The material must be of sufficient competency to resist slaking or dissolution. Gravels of shale, sandstones, or limestones may degrade and shall not be used.

60.504 The material used to cover the top of the stone shall be synthetic drainage fabric or several layers of untreated building paper. Five inches of straw may be substituted when these materials are unavailable. Non porous plastic or treated building paper shall not be used.

60.6 Construction

60.601 The pipe from the septic tank shall have a solid wall and a minimum downward slope of 1/8 inch per foot.

60.602 When there is more than one trench, a manifold shall be installed between the pipe from the septic tank and the absorption trenches. The manifold shall be of water-tight construction. Distribution boxes may be used in lieu of manifolds.

60.603 Both manifolds and distribution boxes shall be set level and arranged so that effluent is evenly distributed to each distribution line. Special provisions shall be made to minimize movement of distribution boxes due to settlement or frost heave. Access for inspection of distribution boxes shall be provided.

60.604 When distribution boxes are used, each distribution line shall connect individually to a distribution box.

60.605 The pipe connecting a manifold or distribution box to a distribution line shall be solid wall with tight joints and properly bedded throughout its length.

60.606 When a manifold is used, there shall be an equal number of distribution lines spaced evenly on both sides of the junction of the inlet pipe to the manifold.

60.607 Distribution lines from a common manifold or distribution box shall be equal in length.

60.608 When the trenches have been excavated, the sides and bottom shall be raked to scarify any smeared soil surfaces. Construction equipment not needed to construct the system should be kept off the area to be utilized for the absorption trenches to prevent undesirable compaction of the soils. Construction shall not be initiated when the soil moisture content is high. (Note: If a fragment of soil occurring approximately nine inches below the surface can easily be rolled into the shape of a wire, the soil moisture content is too high for construction purposes.)

60.609 At least six inches of gravel or crushed stone shall be placed in the bottom of the trench.

60.610 The distribution line shall be carefully placed on the bedding and covered with at least two inches of gravel or stone.

60.611 The ends of the distribution lines shall be capped or plugged or, when they are at equal elevations, they should be connected.

60.612 Systems requiring more than 500 lineal feet of absorption trench shall be dosed.

60.7 <u>Pumping or Dosing System Design</u>

See MDHES Circular WQB 4 for pumping or dosing system requirements.

60.8 <u>Alternating Absorption Area Design</u>

60.801 Under some circumstances, it is desirable to divert the wastewater flow from one soil absorption area to another to provide long-term alternate resting periods. Flow diversion may be accomplished by the use of commercially available diversion valves or by diversion boxes.

60.802 Alternating absorption area design may be utilized as a substitute for dosing systems. Where this design is utilized, an additional absorption area of 50% shall be provided. Three sections are recommended with a minimum distance of 10 feet between sections.

61. <u>Deep Absorption Trenches</u>

61.1 <u>General</u>

Deep absorption trenches may be considered where the depth of suitable soil is insufficient to permit the installation of a conventional trench system due to the presence of a limiting layer more than two feet in depth which overlies suitable soils of sufficient thickness or where freezing may be a problem due to long absence of the inhabitants during the winter. Requirements for location, design, slope, material, construction and dosing system design contained in Section 60, <u>Absorption Trenches</u>, shall apply to deep absorption trenches except for depth of construction (60.306). In addition, the following design considerations shall apply:

a. The site evaluation procedures shall include soil profile observations of at least one soil observation pit constructed to a minimum depth of six feet below the proposed trench bottom. Monitoring to establish depth to seasonal soil saturation or groundwater may be required. The possibility of groundwater contamination shall be considered in accordance with Sections 60.201 and 60.206.

b. Deep absorption trenches shall be constructed at least one foot into suitable soil.

c. The distribution piping in deep absorption trenches shall be installed with the invert of the piping at a depth of not more than 48 inches. Washed gravel or crushed stone shall be placed from the bottom of the trench excavation to a point two inches above the top of the distribution piping.

d. Deep absorption trenches shall not be used when there is a danger of contaminating the groundwater.

November 23, 1998

## APPENDIX A

## PERCOLATION TEST PROCEDURE

### General

Properly conducted percolation tests are needed to determine drainfield site suitability and to size the drainfield. Percolation test should be run within the boundary of the proposed drainfield.

### Test Hole Preparation

1. Dig or bore holes six inches in diameter with vertical sides. Depth of holes shall be equal to the depth of the proposed drainfield trenches, typically 24 inches below ground.

2. Roughen or scratch the bottoms and sides of the holes to provide natural unsmeared surfaces. Remove loose material. Place about two inches of 1/2 to 3/4 inch washed gravel in the bottom of holes to prevent scouring during water addition.

3. Establish a reference point for measurements in (or above) each hole.

### Soaking

1. Fill holes with clear water to a level at least 12 inches above the gravel.

2. If the first 12 inches of water seeps away in 60 minutes or less, add 12 inches of water a second time. If the second filling seeps away in 60 minutes or less, the percolation test should be run in accordance with the sandy soil test, so proceed immediately with the test.

3. If either the first 12 inches or the second 12 inches does not seep away in 60 minutes, the percolation test should be run in accordance with the test for other soils. In these other soils, maintain at least 12 inches of water in the hole for at least four hours to presoak the hole. Do not remove water remaining after four hours. Permit soil to swell at least 12 hours, but no more than 24 hours, then proceed immediately with the test.

### Test

1. Sandy soils

    A. Add water to provide a depth of six inches above gravel. Measure water level drop every 10 minutes for one hour. Measure to nearest 1/16-inch. Refill to six-inch depth after each measurement. Do not exceed six-inch depth of water. Use final water-level drop to calculate rate.

B. Use a shorter time interval only if first six inches seeps away in ten minutes or less. Measure water level drop a minimum of six times. Refill to six-inch depth after each measurement. Do not exceed six-inch depth of water. Use final water-level drop to calculate rate.

2. Other Soils

A. Remove loose material on top of gravel.

B. Add water to provide a depth of six inches above gravel. Measure water level drop every 30 minutes for four hours, or until two successive drops do not vary by more than 1/16 inch (stabilized rate achieved). Measure to nearest 1/16-inch. Refill to six-inch depth after each measurement. Do not exceed six-inch depth of water. Use final water-level drop to calculate rate.

Records

Record the following information on the attached form, and include as part of the application:

1. Date(s) of test(s),
2. Location, diameter and depth of each test hole,
3. Time of day that each soak period began and ended,
4. Time of day for beginning and end of each water-level drop interval,
5. Each water-level drop measurement,
6. Calculated percolation rate,
7. Name and signature of person performing test,
8. Name of owner or project name.

Rate Calculation

Percolation Rate = Time interval in minutes / Water-level drop in inches

# PERCOLATION TEST FORM

Owner Name ______________________________

Project Name ______________________________

Lot or Tract Number ________________ Test Number ________________

Diameter of Test Hole ________________ Depth of Test Hole ________________

Date and Time Soak Period Began ____________ Ended ________________

Date and Time Test Began ______________________

Test Results

| Start Time of Day | End Time of Day | Time Interval (minutes) | Initial Distance below reference point | Final Distance below reference point | Drop in water level (inches) | Percolation Rate (minutes/inch) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

I certify that this percolation test was done in accordance with WQB-6, Appendix A.

________________ Name (printed)

________________ Signature

________ Date

________________ Company

# Appendix D

## Progress Photographs of the Screening Plant Site
## Taken on April 18, 2001

# Color Photo(s)

The following photos contain color that does not appear in the scanned images.
To view the actual images please contact the Superfund Record Center at (303) 312-6473.

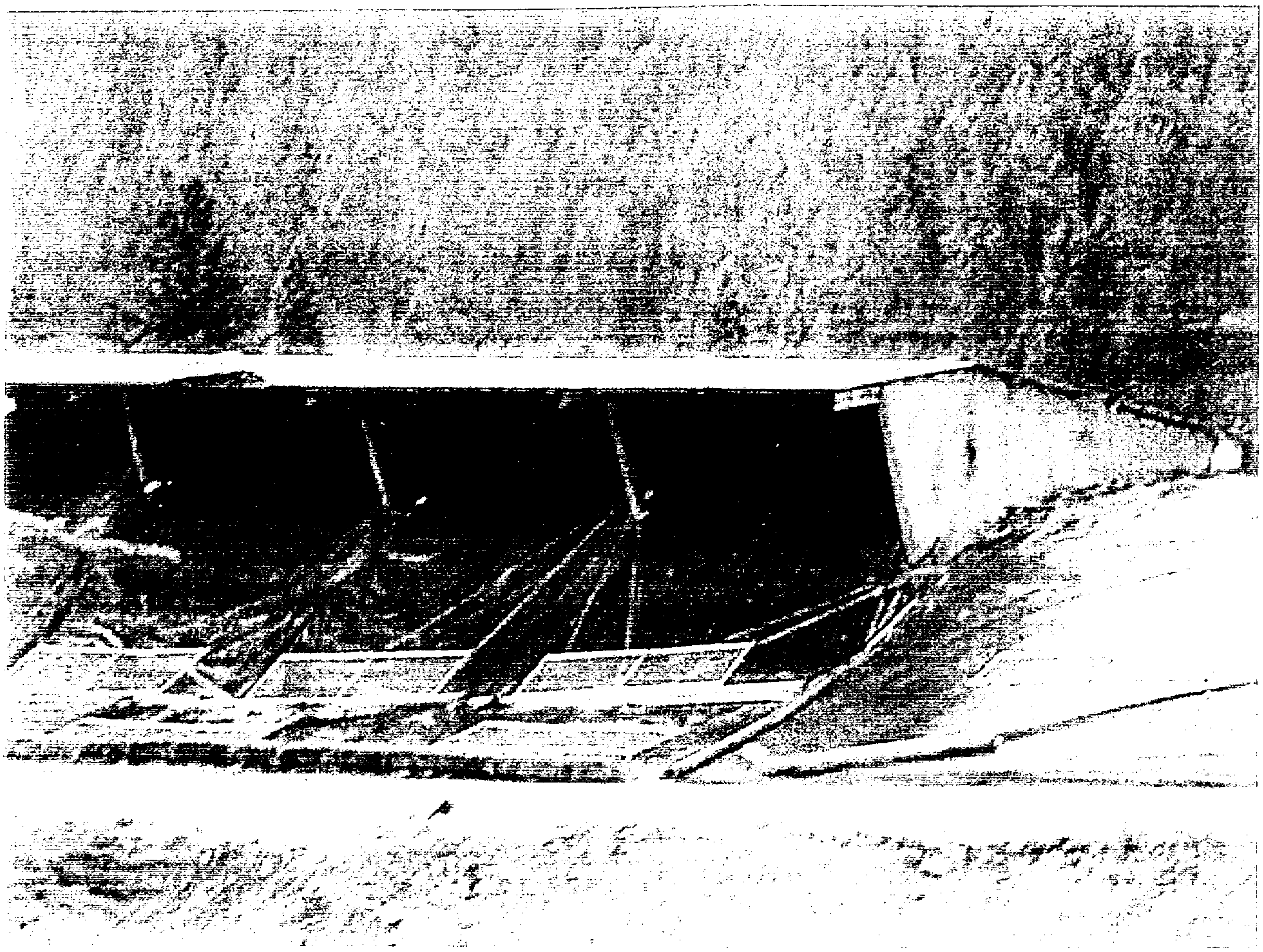

Photo 1: Long shed with winter cover

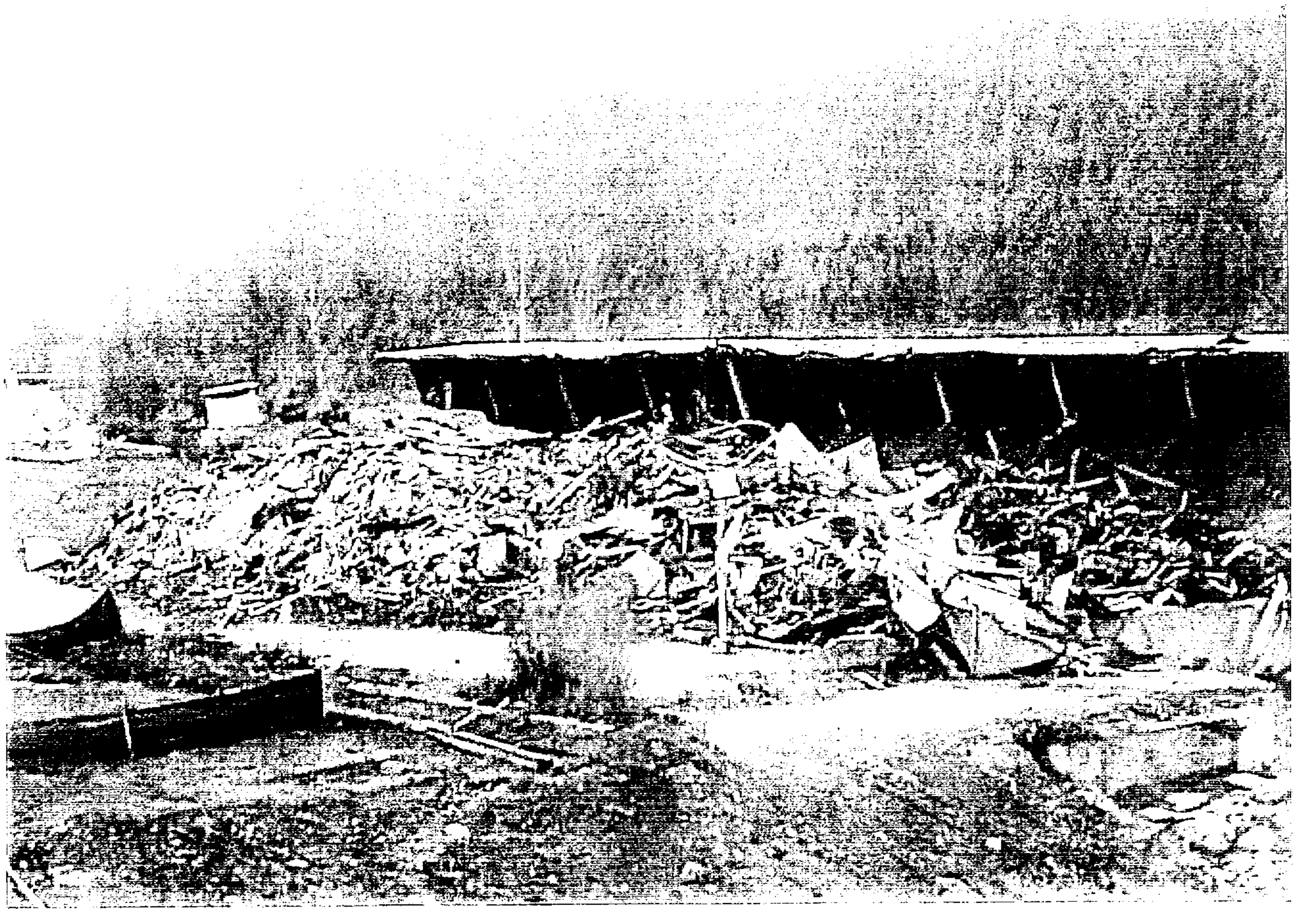

Photo 2: Debris pile/footers

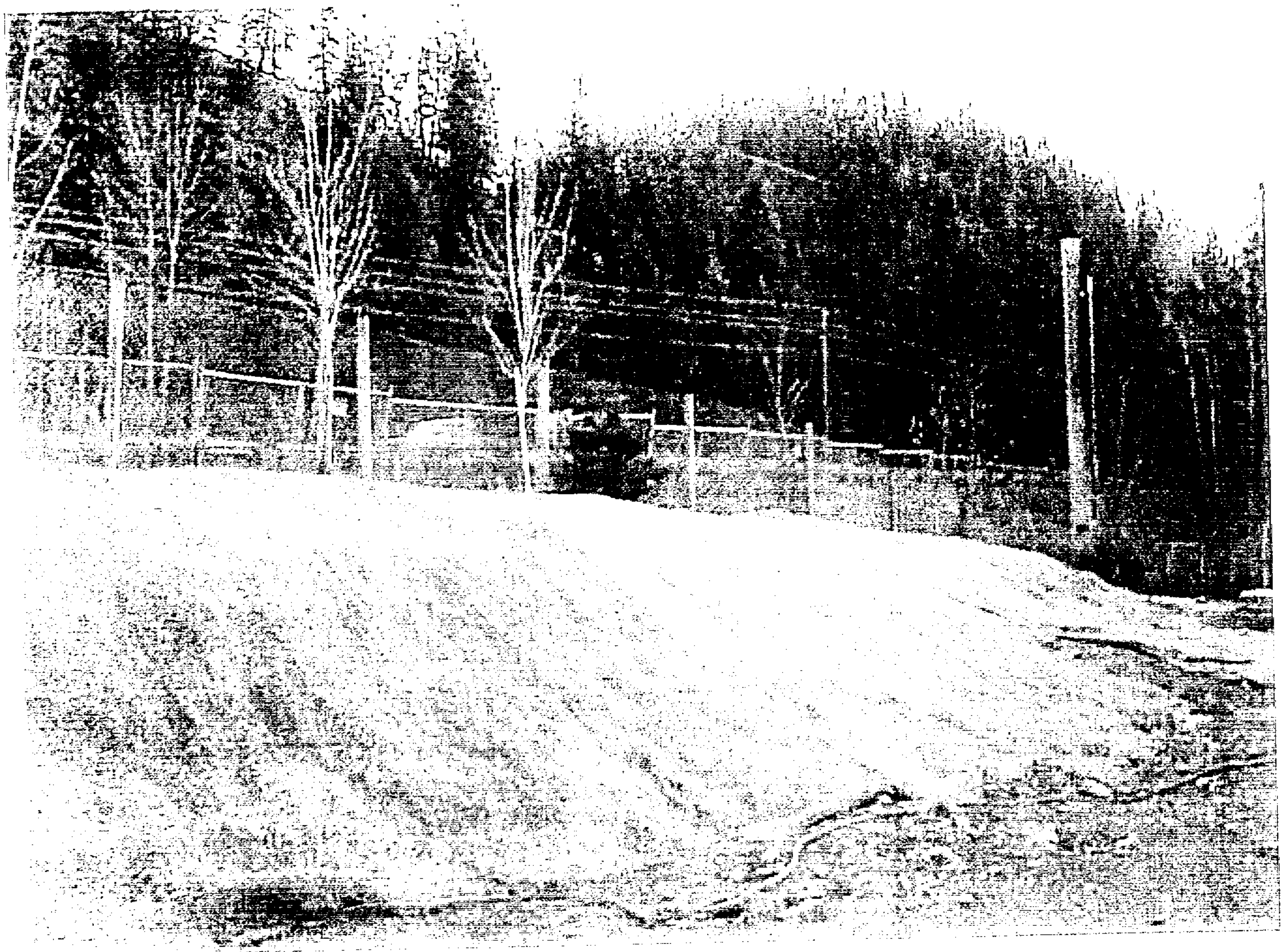

Photo 3: Route 37, Screening Plant winterization erosion controls

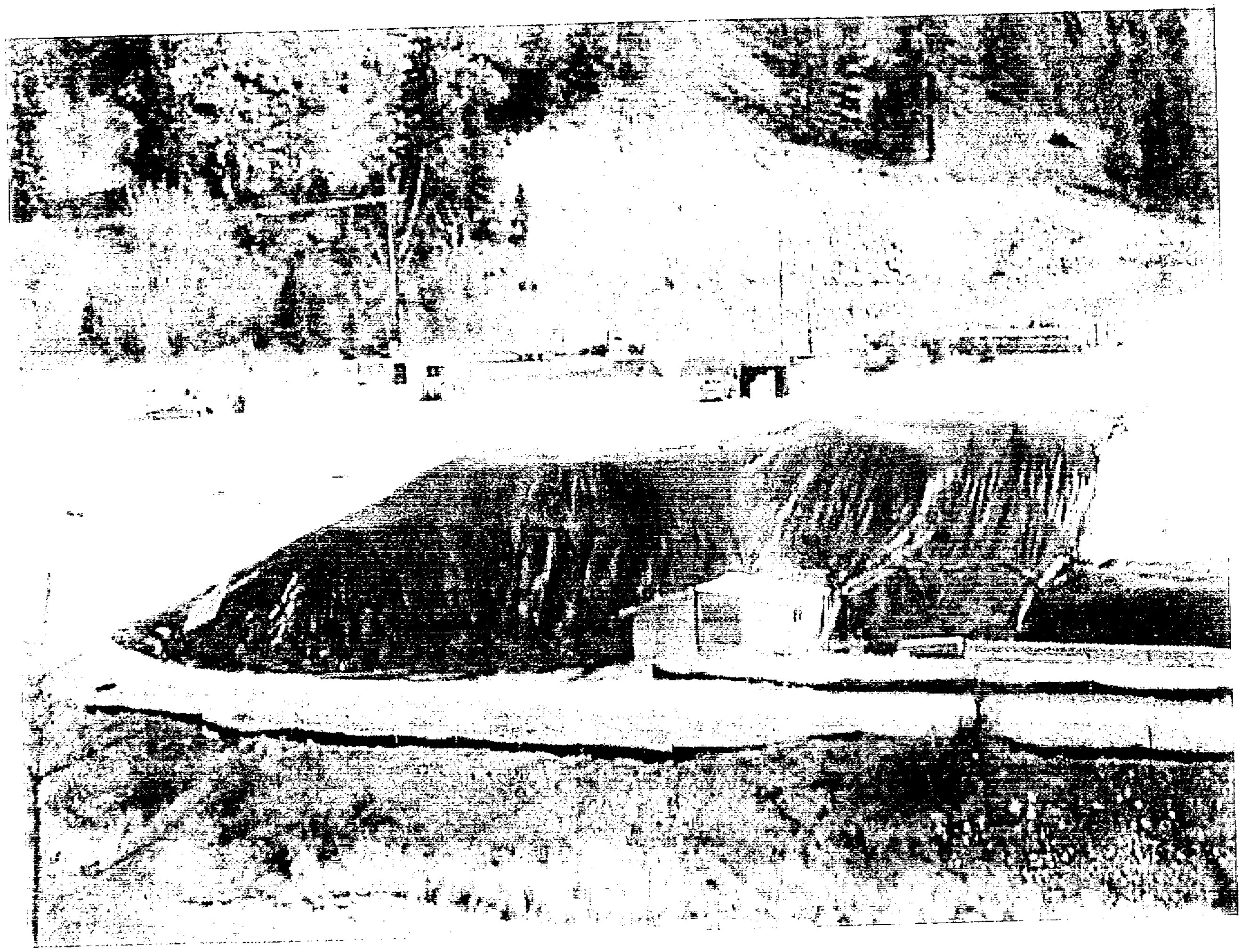

Photo 4: Stock pile, north end winterized

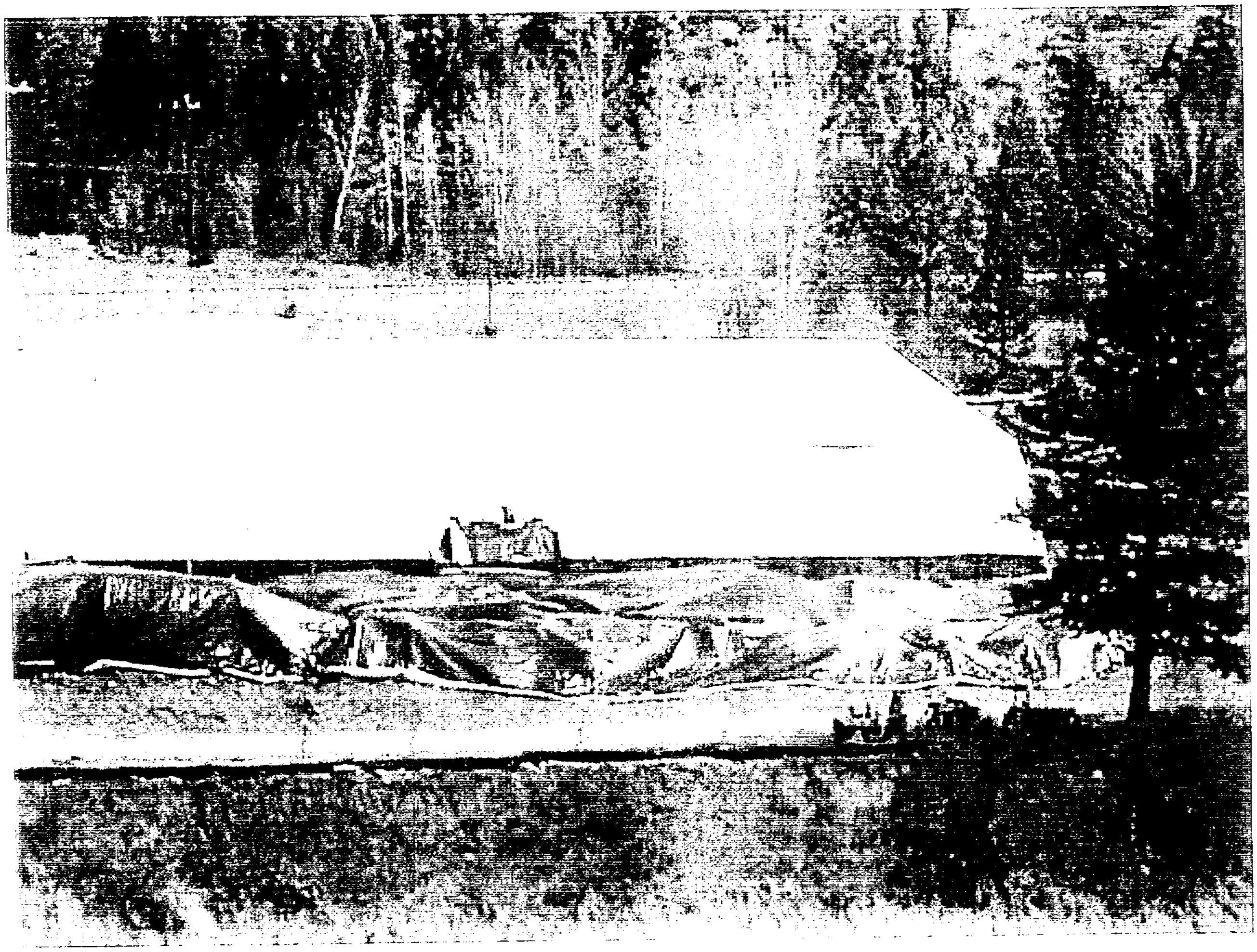

Photo 5: Long shed winterized debris area

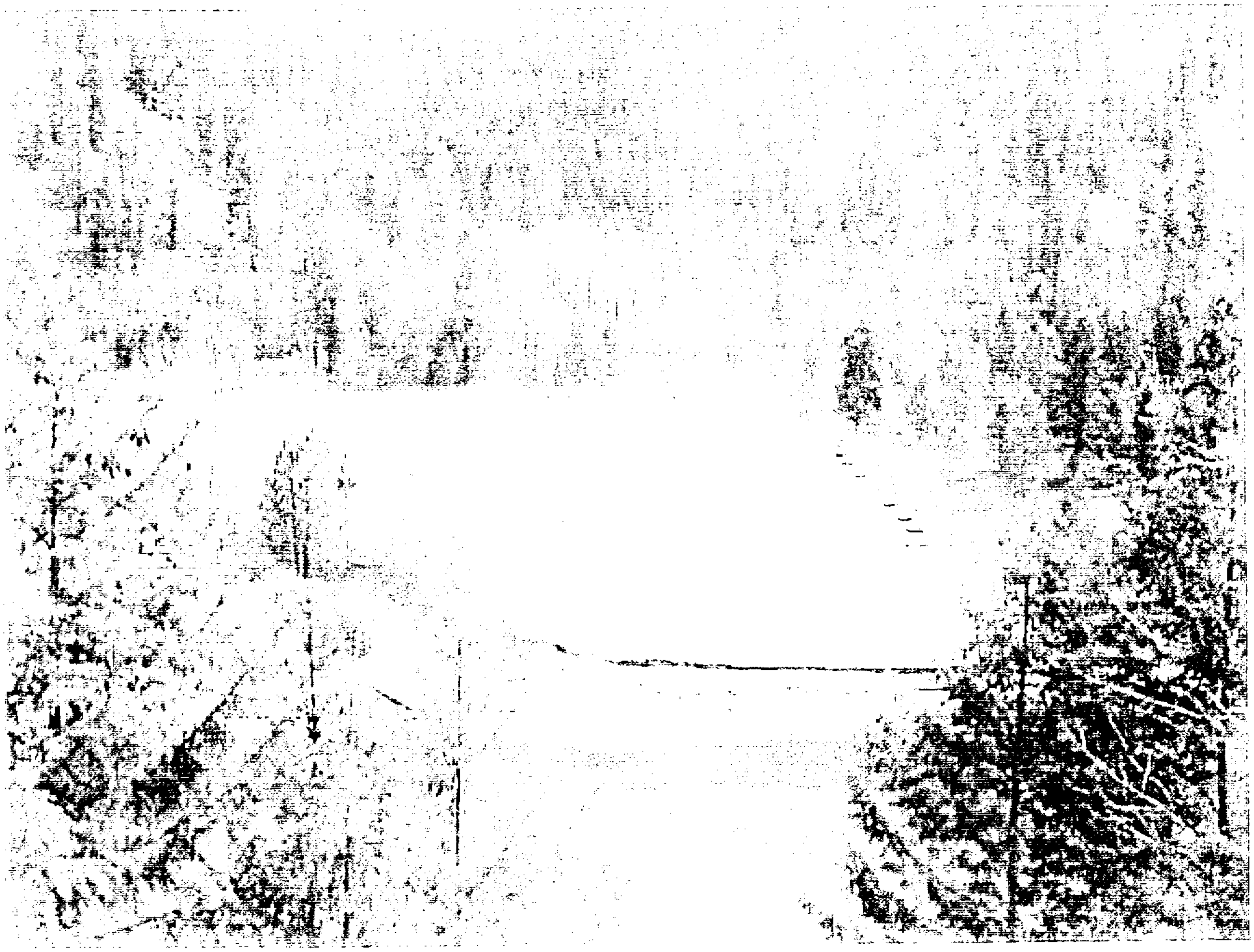

Photo 6: Former Screening Plant south half winter erosion controls and riprap

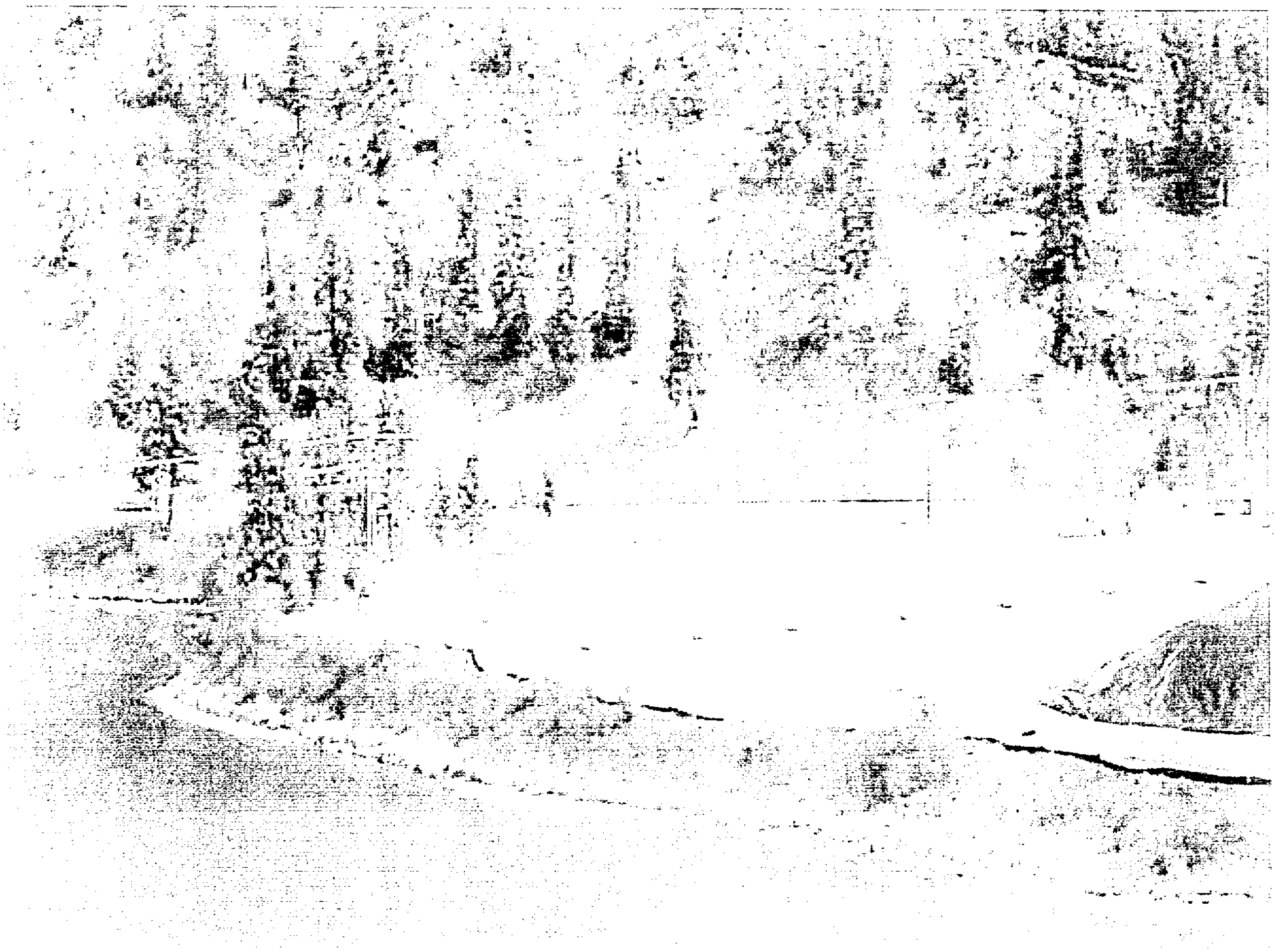

Photo 7: Erosion controls, Screening Plant site